



Munich Personal RePEc Archive

Pension systems in 15 countries compared: the value of entitlements

Whitehouse, Edward

University of New South Wales, Axia Economics

February 2001

Online at <https://mpra.ub.uni-muenchen.de/14751/>
MPRA Paper No. 14751, posted 23 Apr 2009 03:23 UTC

UNSW



**PENSION SYSTEMS IN 15 COUNTRIES
COMPARED: THE VALUE OF ENTITLEMENTS**

EDWARD WHITEHOUSE

DISCUSSION PAPER

02/04

CENTRE FOR PENSIONS AND SUPERANNUATION

PENSION SYSTEMS IN 15 COUNTRIES COMPARED: THE VALUE OF ENTITLEMENTS

EDWARD WHITEHOUSE

This paper calculates prospective pension entitlements for illustrative workers at different income levels in 15 OECD countries. The modelling includes universal and resource-tested schemes, public and private earnings-related plans and mandatory defined contribution schemes. The paper includes a detailed description of pension systems, gross pension benefits and benefits net of tax. The results show considerable differences in the philosophy of different countries pension schemes, particularly in the importance of insurance and redistributive motives.

ACKNOWLEDGEMENTS

An analysis of pension systems in nine countries formed part of the OECD's assessment of retirement-income systems (OECD, 2001*b*) and will appear as Whitehouse (2002). The extension to the further six countries also covered here is part of an OECD project to analyse retirement incentives in different countries.

I am grateful to Bernard Casey, Peter Hicks, Howard Oxley, Monika Queisser and Juan Yermo of the OECD secretariat, Pablo Antolin of the IMF; Robert Palacios of the World Bank and Richard Disney of the University of Nottingham and the Institute for Fiscal Studies for useful discussions, commentary and information. The analysis has also benefited from discussion at a number of OECD meetings with officials from OECD member governments. The usual disclaimer, of course, applies.

CORRESPONDENCE

Edward Whitehouse
Axia Economics
38 Concanon Road
London SW2 5TA
United Kingdom
e-mail: edward.whitehouse@axiaecon.com

DISCUSSION PAPER NO. 02/04

APRIL 2002

Table of contents

1. Country descriptions	11
1.1 Australia	11
1.2 Canada.....	13
1.3 Finland	15
1.4 France.....	18
1.5 Germany	19
1.6 Italy	21
1.7 Japan	23
1.8 Korea.....	25
1.9 Netherlands	26
1.10 Norway	28
1.11 Spain.....	29
1.12 Sweden.....	29
1.13 Switzerland.....	34
1.14 United Kingdom	36
1.15 United States.....	40
2. Empirical results: gross pension benefits	42
3. Empirical results: net pension benefits	56
4. Voluntary private pensions	62
4.1 Modelling occupational pension values.....	64
4.2 United Kingdom.....	65
4.3 United States	69
4.4 Canada.....	70
5. Pensions for different family types and additional analyses	72
5.1 Married couples	72
5.2 Gaps in contribution records.....	73
5.3 Self-employed.....	75
5.4 Post-retirement indexation of pension benefits.....	76
6. Conclusion	79
7. Bibliography.....	82

Figures and tables

Table 1. Earnings of the average production worker	10
Table 2. Coverage of different earnings-related pension programmes in Finland	17
Table 3. Coverage of different private pension arrangements in Japan	25
Table 4. Occupational pension coverage in Sweden by scheme, 1999	33
Table 5. Credits to individual pension accounts by age, Switzerland	35
Table 6. Second-tier pension provision in the United Kingdom, 1995-96	38
Table 7. State-level maximum supplements to Supplemental Security Income	41
Figure 1. Mandatory pension benefits as a proportion of economy-wide average earnings by individual earnings, 15 countries	45
Figure 2. Mandatory pension benefits as a proportion of individual pre-retirement earnings, 15 countries	51
Table 8. Total mandatory pension benefits as a percentage of economy-wide average earnings by individual earnings level	54
Table 9. Maximum pensionable earnings and maximum pension benefits, percentage of economy-wide average earnings	54
Table 10. Total mandatory pension benefits as a percentage of individual earnings by individual earnings level	55
Figure 3. Gross and net replacement rates	57
Figure 4. Gross and net pension values by earnings	60
Table 11. Percentage of pensioners with income from employer-provided pensions and percentage of workers covered by occupational pension plans, late 1990s	63
Table 12. Percentage of workers covered by occupational pension plans	63
Table 13. Features of model defined benefit occupational pensions in Canada, the United Kingdom and the United States	64
Figure 5. Pension replacement rate as a percentage of final salary by number of schemes joined and rate of individual earnings growth, United Kingdom	66
Figure 6. Value of public and private pension benefits in the United Kingdom, proportion of economy-wide average earnings	68
Figure 7. Pension replacement rate as a percentage of final salary by number of schemes joined and rate of individual earnings growth, United States	70
Figure 8. Pension replacement rate as a percentage of final salary by number of schemes joined and rate of individual earnings growth, Canada	71
Figure 9. Value of public and private pension benefits in Canada, proportion of economy-wide average earnings	72
Table 14. Pension systems and the self-employed	76
Table 15. Post-retirement indexation procedures in different pension systems	77
Figure 10. Effect of different post-retirement indexation procedures on pension values in payment	78
Table 16. Net present value of pension under different indexation procedures	79
Figure 11. Pension values as a proportion of economy-wide earnings for workers earning between one half and twice average	80

Pension systems in 15 countries compared: The value of entitlements

Edward Whitehouse

The main goal of retirement-income systems is to ensure that the elderly have the resources to support an adequate standard of living. The most common method of measuring countries' success in achieving this objective is to compare directly current pensioners' incomes with general living standards. There are many examples of this 'empirical' approach to looking at the effect of pension systems on the incomes of the elderly, although most form part of broader studies of the distribution of income.¹ While this direct, empirical approach can be very informative, it is silent on a number of important questions. First, it can be an ineffective way of assessing current pension systems. Today's pension outcomes depend as much on past rules of the pension system as they do on the current parameters. These rules have changed significantly over time. Moreover, some schemes have not yet matured and this will affect both levels of current pensioners' incomes and the pattern of incomes with characteristics such as age and marital status. Secondly, current pension outcomes depend on people's earnings, employment and contribution records. Past macroeconomic conditions, again in constant flux, will also have affected pensioners' incomes.

This paper adopts a second method, which might be called an 'institutional' approach. It calculates prospective pension entitlements of illustrative workers with particular characteristics. The model used here applies the pension system's parameters —

¹ See, for example, Atkinson, Rainwater and Smeeding (1995), Börsch-Supan (1997), Burniaux *at al.* (1998), Disney and Johnson (2001), Disney, Mira d'Ercole and Scherer (1998), Förster and Pellizzari (2000), Hauser (1997) and Johnson (1998). These and other studies are surveyed in Disney and Whitehouse (2001) and Whitehouse (2000*e*).

such as accrual rates, minimum pensions, indexation rules, eligibility requirements *etc.* — to calculate pension benefits. The results are typically expressed as replacement rates: the ratio of the pension benefit either to the individual's earnings or to a measure of economy-wide earnings. Unlike empirical studies, therefore, the institutional approach can assess the impact of the rules of the current pension system on current workers.

Nevertheless, this institutional approach also has a number of potential problems. First, it assumes that the structure of the pension system and its parameters remain unchanged in the future. But the frequency and the scale of past pension reforms suggest that future pension regimes will look very different from today's systems.² Secondly, it ignores the resources, other than pensions, on which the elderly can draw, such as investments and non-financial wealth, especially housing. A third, related issue is the fact that many of the elderly live in larger households. Individual-level replacement rates ignore the sharing of resources with other household members.

For these reasons, empirical analysis of income-distribution data and the forward-looking calculation of pension entitlements should be viewed as complementary parts of the assessment of retirement income systems

There have been a number of previous institutional studies that share this paper's aim of calculating pension entitlements for illustrative workers.³ Some of these are out of date. Some have ignored private pension benefits or treated them only cursorily.⁴ Some have ignored the effect of direct taxes and looked only at gross pension entitlements. This understates pensioners' relative incomes for a number of reasons.⁵ Pensioners often do not pay social-security contributions. Personal income taxes are progressive: the average tax rate on (lower) pension income will be less than the tax rate on (higher) earned income. In addition, most income tax systems give preferential treatment to pensions (exempting some or all of income from tax) or to pensioners (giving additional allowances, credits or zero-rate bands to the elderly). Replacement rates net of taxes and contributions are higher than gross figures.

² McHale (1999) studies the impact of reforms on future pension entitlements in the G7 countries. Diamond (1997) argues that pension systems can be excessively responsive to short-term fiscal conditions (given the limited ability of the elderly to absorb these changes).

³ Eurostat (1993), Aldrich (1982), Johnson (1998), Table 1.1 and McHale (1999).

⁴ The values of private pension benefits are modelled using data on the rules of actual system rather than the illustrative target replacement rates employed in Eurostat (1993). The latter also ignores the important issue of lack of portability of defined-benefit occupational pensions: see below.

⁵ See Whiteford (1995) for a discussion of these issues.

The following section of the paper discusses 15 industrialised countries in turn. Each section by sets out the key parameters of the pension system, discussing different components separately. These components can include:

- Flat-rate, universal, public benefits, here called basic pensions for short.
- Resource-tested public benefits, where the benefit is withdrawn from richer pensioners. These can be means-tested, where both assets and income are taken into account, purely income-tested or withdrawn only against pension income.
- Earnings-related public benefits (including the so-called ‘notional-accounts’ based schemes in Italy and Sweden). These schemes pay a higher benefit to people whose earnings were higher during their working lives.
- Employer-provided pensions, which are usually defined benefit (they pay a specific sum or proportion of earnings for each year of membership), called occupational pensions in this report.
- Mandatory personal pensions (which have a defined contribution formula, so the pension benefit depends on contributions made and investment returns earned), known in the United States as ‘individual accounts’.

As ever, there are many borderline cases. Earnings-related pensions in Finland, the Netherlands and Sweden, for example, are ostensibly privately provided. However, in Finland, these occupational pension schemes are statutory. In the Netherlands and Sweden, collective bargaining has resulted in near universal coverage: these plans are best thought of as ‘quasi-mandatory’. In contrast, employers provide occupational schemes voluntarily in Canada, Germany, Japan, the United Kingdom and the United States.

The severance pay scheme in Korea provides lump sums to departing employees of any age. It has been included because many individuals use these resources to support their old age.

The personal defined contribution schemes included are the new superannuation guarantee in Australia, the new mandatory scheme in Sweden and personal pensions in the United Kingdom. The latter are mandatory in the sense that people must make some provision for a second pension above the basic level, but this can be through either the public-sector scheme, an occupational scheme or a personal pension plan.

Sections 2 and 3 present the core empirical results: the value of pension benefits in the 15 countries. The results are presented in a standard format and on standard

assumptions. Pension benefits are calculated for a full-career worker earning various proportions of economy-wide average earnings, between 0.3 times and five times the average. Although most workers, of course, lie in the bottom part of this scale, a broad range of earnings was chosen to illustrate properly the impact of ceilings on pensionable earnings. People are assumed to retire at the standard pension age, which is typically 65 in these countries.

The average earnings data are the pay of the average production worker, as set out in OECD (2000). For reference, Table 1 shows these earnings levels in national currency and in United States dollars. Earnings have been translated into dollars using OECD purchasing power parities, which calculate the cost of a common basket of goods in each country. Market exchange rates, of course, fluctuate wildly, and can generate very misleading results. Real earnings, both of the illustrative worker and the economy as a whole, are assumed to grow at two per cent a year.

Table 1. Earnings of the average production worker

	National currency	US dollars at PPP
Australia	39 800	30 600
Canada	35 000	30 200
Finland	140 600	23 300
France	136 300	20 600
Germany	59 500	29 600
Italy	38 873 400	24 000
Japan	4 203 500	25 800
Korea	17 706 000	27 300
Netherlands	57 500	27 800
Norway	265 700	27 700
Spain	2 416 400	18 500
Sweden	215 500	22 400
Switzerland	60 200	30 900
United Kingdom	17 500	26 600
United States	29 100	29 100

Note: all values rounded to the nearest hundred. Conversion to dollars uses OECD purchasing power parities

Source: OECD (2000)

The model uses the current parameters of the system, including any future changes that have already been legislated. Governments, of course, frequently reform pension systems. People retiring today, for example, have spent their working lives in many different and changing regimes. Their pension benefits can be calculated under many

different rules. This is therefore an unrealistic assumption, but it is difficult to formulate a sensible alternative.

Looking into the future, some countries adjust some parameters of their pension system in line with prices. This can have radical effects on the long-term structure of the scheme. The baseline results therefore assume that parameters will rise in the long term in line with earnings. Where pension programmes are resource-tested, it is assumed that the individual has no sources of income other than the mandatory pension.

Section 4 looks at voluntary private pensions in three countries: Canada, the United Kingdom and the United States.⁶ Section 5 extends the analysis in a number of ways. First, the main analysis assumes a single worker: this section looks at the treatment of married couples. Secondly, the section examines the treatment of workers with less than a full career: what happens to people's pension entitlements when they are out of work because they are either unemployed or caring for children or elderly relatives? Thirdly, the baseline assumption is that the worker is employed, but countries differ in their treatment of the self-employed. Section 5 ends with an exploration of the issue of post-retirement indexation of pension benefits. The baseline results provide only a snapshot picture of pension benefits at normal pension age, but the procedure for uprating benefits has substantial effects on the value of the lifetime stream of pension payments. Section 6 concludes.

1. Country descriptions

1.1 Australia

Australia's mandatory pension system has two components: a means-tested age pension plus the superannuation guarantee, a compulsory contribution to a private pension plan.

⁶ As noted previously, occupational plans are considered alongside public schemes in Finland, the Netherlands and Sweden. Data on the rules of schemes in Germany and Japan are unavailable, but occupational pensions are less important in these countries.

1.1.1 Age pension

The full age pension for a single person in 1999 was A\$372 paid fortnightly, that is A\$9,672 a year. This was equivalent to a quarter of average earnings. Married couples receive a joint pension of 42 per cent of average earnings. The age pension is withdrawn once annual income from other sources exceeds a ‘free area’ of \$2,652 for a single person (equivalent to 6.7 per cent of average earnings). The withdrawal rate is 50 per cent. There is also an assets test. However, some 94 per cent of pensioners affected have their benefits reduced by the income rather than the assets test. Around a third of pensioners have their benefit reduced by the means test, with the other two-thirds on the full age pension.

The age pension is paid from age 65 for men. Women’s pensionable age — currently 61 — will increase gradually to 65 from 2013. The age pension’s value is increased in line with the higher of earnings or prices.

1.1.2 Superannuation guarantee

This second element of the Australian mandatory pension regime was introduced in 1992. It consists of a mandatory employer contribution to a private pension plan, which can be an industry-wide fund or a scheme operated by financial-services companies on behalf of an employer. The mandatory contribution rate will reach nine per cent in 2002. Workers earning less than A\$5,400 a year (equivalent to about 14 per cent of average earnings) are not required to contribute, but can choose to do so.

The minimum age for withdrawing benefits is currently 55, but this will increase gradually to 60 by 2025.

Before the superannuation guarantee was introduced, around 50 per cent of employees participated in voluntary occupational pension plans with both defined benefit and defined contribution formulae. Employers are able to put out of the superannuation guarantee if they can show that the benefits from their occupational plan are at least as good.

The calculation of the value of the benefits from the superannuation guarantee is complicated by the tax treatment of contributions, investment returns and benefits. A 15 per cent tax is levied on employer contributions to the fund. Nominal investment earnings and real capital gains of the fund are taxed, again at 15 per cent. Income streams deriving from the accumulated capital are taxed, but with a 15 per cent rebate.

A second issue is the withdrawal of pension benefits. Although there are some defined benefit occupational plans, most employees are members of defined contribution plans. Members can take out the accumulated capital as a lump sum or some sort of income stream. Currently, most benefits are taken as a lump sum and phased withdrawals are the most popular form of income stream. For comparison with other countries (where defined benefit plans predominate), the capital from the superannuation guarantee is converted to a price-indexed annuity. The annuity calculation is based on population life tables averaged across four OECD countries.⁷

1.2 *Canada*

Canada's public pension system is made of three components. A universal, flat-rate pension, known as old-age security, can be topped up with an income-tested benefit, known as the guaranteed income supplement. A tier of earnings-related benefits is known as the Canada Pension Plan/Québec Pension Plan. The two plans offer broadly similar benefits.

1.2.1 *Basic pension*

The basic tier is subject to a residency test, with $\frac{1}{40}$ th of the maximum pension earned for each year of residence after age 18 up to a maximum of 40 years. A minimum of ten years' residency is required to receive any benefit. The 1999 benefit level was C\$411.23 a month — 14 per cent of average earnings — payable from age 65. This pension is subject to a means test operated through the tax system (often described as a 'claw-back'). Once income exceeds C\$53,215 it is withdrawn at a 15-per-cent rate. This ceiling is equivalent to just over 1½ times average earnings. It is indexed to prices.

1.2.2 *Income-tested pension*

An income-tested supplement is available to low-income pensioners. This gives a maximum pension, including the universal benefit, of C\$899.95 (31 per cent of average

⁷ Canada, France, Sweden and the United States. Data drawn from the Berkeley mortality database. This is a matter simply of metrics and is not intended to represent either people's behaviour or the annuities on offer in the market.

earnings) for a single person and C\$1,459.12 (50 per cent) for a couple. The benefit is withdrawn against income other than the basic pension at a 50-per-cent rate. Both the basic and means-tested components of the state pension are price indexed.

1.2.3 Earnings-related pension

The second-tier, earnings-related pension targets a 25-per-cent replacement rate. It is based on average lifetime salary, with earlier years' pay revalued in line with economy-wide earnings. A single year's contribution is sufficient to generate an entitlement. The averaging formula excludes the 15 per cent of years between age 18 and 65 with the lowest earnings and any years spent caring for a child under age seven. Currently, virtually all retired men and 85 per cent of women qualify for some earnings-related pension benefits. The government expects the latter proportion to increase to 90 per cent by 2050. The maximum earnings-related pension is C\$751.67 a month (26 per cent of average earnings). People earning less than C\$3,500 a year (10 per cent of average earnings) are not required to contribute. There is a ceiling of C\$37,4000 (107 per cent of average earnings) to both contributions and benefits, which is indexed to average earnings, while the contribution floor is frozen in nominal terms. The value of the pension after retirement is updated annually in line with prices.

1.2.4 Private pensions

Over 40 per cent of the Canadian workforce are members of occupational pension schemes, known as retirement pension plans. Around 45 per cent of this total are members of public sector schemes. This gives a coverage rate in the private sector of around 30 per cent compared with nearly 100-per-cent coverage among public-sector employees. There was a shift to defined-contribution schemes in the 1980s and 1990s in the private sector, but these plans still account for just 13 per cent of total members (including hybrid plans with defined-benefit and defined-contribution elements). Over 60 per cent of members are in final-salary defined-benefit schemes, with 10 per cent in schemes with an average-salary formula and 20 per cent in plans that provide a flat benefit for each year of membership. Most schemes cover the entire workforce, but 20 per cent of members are in schemes reserved solely for members of trades unions.

Most occupational schemes —covering 90 per cent of members — are compulsory for people eligible to join. Typically, eligibility is determined by years of service (to a legal maximum of two years). Vesting rules vary by province, but are generally two years of membership or five years' service. Some also depend on age. Pensions can be transferred to another occupational scheme or a personal plan when a worker changes jobs, or 'preserved' in the old occupational scheme until an employee reaches pension age.

Pension age is generally 65, but a significant minority of public-sector members can claim their pension at 60. The accrual rate in public sector schemes is nearly always two per cent of earnings for each year of service. The earnings formula is usually based on the best five years. In the private sector, two per cent is also the most common accrual rate, accounting for nearly half of members. But almost a third have accrual rates between 1½ and two per cent and another 10 per cent between 1 and 1½ per cent per year of service. There has been a shift towards the norm of two-per-cent accrual, partly because this is the maximum allowed in the income-tax regulations.

Most schemes are integrated with the public earnings-related scheme, giving a lower accrual rate (usually 1.3 to 1.5 per cent) on the slice of earnings up to the ceiling for the second-tier pension. Lump-sum benefits are not permitted.

In 1989, post-retirement indexation was automatic for 70 per cent of members of public-sector schemes, but only for 7.5 per cent in the private sector. However, only 28 per cent of public sector members were guaranteed full inflation uprating. Most large schemes, however, provided for *ad-hoc* increases that generally compensate for about half of inflation.

1.3 Finland

Finland has a two-tier pension system, including a basic state pension and a range of different earnings-related plans for different groups of workers.

1.3.1 Basic pension

The basic pension (known as the national pension) is a universal benefit, withdrawn against pension income from the earnings-related schemes. It is payable from age 65. The

parameters of the system differ from one municipality to another to reflect regional differences in the cost of living. The basic benefit is between FM26,472 (19 per cent of average earnings) and FM31,500 a year (22 per cent of average earnings).⁸ If other pension income exceeds FM2,990 a year, then the basic pension is reduced by 50 per cent of the difference. This threshold is equivalent to two per cent of economy-wide average earnings. No pension is payable once other pension income exceeds FM54,500 to FM64,560 — 39 to 46 per cent of average earnings — depending on municipality and marital status.⁹

Eligibility is determined by a residence test. The full benefit is payable with 40 years residence as an adult, with *pro-rata* adjustments for shorter periods of residence.¹⁰ The basic pension benefit and the parameters of the means test are uprated annually in line with prices.

The basic pension is an individual entitlement. Supplements that are payable in respect of spouses with no entitlement of their own are being phased out.

1.3.2 *Earnings-related pension*

A range of different second-tier schemes covers different groups in the labour market. Table 2 shows membership of the different plans. Until the early 1990s, public-sector pensions were more generous than the private-sector schemes, but the rules in the two sectors were then aligned.

⁸ The modelling uses the maximum municipal benefit level.

⁹ There remains a small basic element that is not means-tested. This has been ignored because it is worth just FM63 a month in 2000 (0.5 per cent of average earnings) and will be abolished completely in 2001.

¹⁰ Note that the elderly who have spent long periods of their working lives in other countries are entitled to general, means-tested social assistance. This guarantees a minimum income of between FM23,508 and FM24,564 a year (around 17 per cent of average earnings). This is between 12 and 22 per cent below the means-tested pension. Again, the different benefit levels apply in different regions. Married couples are each entitled to 85 per cent of the value of the benefit for a single person.

Table 2. Coverage of different earnings-related pension programmes in Finland

<i>Coverage</i>	<i>Scheme</i>	<i>Members (%)</i>
Private-sector employees		
Main scheme	TEL	51.7
Blue-collar workers in construction <i>etc.</i>	LEL	3.8
Household workers, low-earner, short-contract workers	TaEL	1.2
Sailors	MEL	0.3
Self-employed		
Farmers	MYEL	5.4
Other self-employed	YEL	7.3
Public-sector employees		
Central government	VEL	8.7
Local government	KVTEL	20.9
Church	KiEL	0.7

As with the basic pension, the earnings-related benefit is payable from age 65. The benefit is 1.5 per cent of average pensionable pay for each year of employment between age 23 and 59. Between 60 and 64, a pension of 2.5 per cent of pay is earned for each year of coverage. The system also covers people when they are not working, with an accrual rate of 1.2 per cent a year for each year on unemployment benefits. There is a ceiling of 60 per cent to the total replacement rate, so someone covered continuously from age 23 will reach the maximum benefit at age 62.

There is no contribution floor, and no ceiling either to contributions or to benefits. Pensionable pay is defined as gross earnings less employees' pension contributions averaged over the last ten years of employment in a particular scheme, revalued in line with a mix of economy-wide earnings and prices.¹¹ Years with exceptionally low earnings can be ignored.

After retirement, the earnings-related pension is uprated using a formula of 20 per cent of earnings inflation and 80 per cent of price inflation.¹² The Central Pension Security Institute co-ordinates the schemes, resulting in a single pension payment even for people who have joined different plans at different stages of their working lives. About 85 per cent of workers in the private-sector are members of plans operated by insurance

¹¹ The averaging period was four years until 1996. The increase to ten years is being phased in gradually and will be implemented in full from 2005.

¹² Pensions drawn early (between 60 and 64) have a more generous indexation procedure: 50 per cent of earnings inflation and 50 per cent of price inflation.

companies. Large employers — with a workforce of 300 or more — are permitted to set up their own pension funds.

1.4 France

The pension system in France has two components: an earnings-related public pension and mandatory occupational schemes.

1.4.1 Public pension

The state pension targets a replacement rate of 50 per cent after 40 years' contributions. Shorter contribution periods result in a proportionally reduced pension. There is a ceiling on eligible earnings, which in 1999 was FFr 173,640, equivalent to nearly 125 per cent of average earnings. There is a minimum pension, which was FFr 39,416 in 1999, or 29 per cent of average earnings.

1.4.2 Occupational pension

The modelling is based on the ARRCO scheme, which covers the majority of employees. Different rules apply to 'cadres' and 'non-cadres'. The following applies to non-cadres.

ARRCO is a points based system. Although actual contributions are higher, benefits are only earned on six per cent of earnings. The ARRCO ceiling is three times that of the public pension scheme, that is FFr 550 920, or nearly 375 per cent of average earnings. Each year, the value of contributions is divided by the cost of a pension point. At retirement, the accumulated number of points is converted into a pension benefit by multiplying by the value of a pension point. The 1999 value of a point was FFr 6.62 and the cost, FFr 71.85.

Over the past four years, the average increase in the cost of a point has been 3.4 per cent and the average increase in its value, 1.2 per cent. These are approximately the increase in earnings and prices respectively and this is the uprating procedure assumed in the modelling.

1.5 Germany

The German public pension system has a single tier, including both redistributive and insurance elements. Coverage of occupational pensions is broad.

1.5.1 Earnings-related pension

The formula for the earnings-related pension is based on a system of points. One point is awarded for a year's contributions at the average earnings of contributors (up to the contribution ceiling). Contributions are levied on earnings between DM630 and DM102,000 a year, equivalent to one and 171 per cent of average earnings respectively.¹³ People in short-term employment (up to 50 working days a year) are exempted regardless of their earnings, but people who work 15 hours or more a week must contribute even if their earnings fall below the floor. The ceiling also applies to the number of benefit points earned. Average covered earnings were DM53,082 in 1999 and are forecast to be DM54,513 in 2000. This is equivalent to 92 per cent of the earnings of the average production worker (the average earnings measure used in this paper). Contributions paid on earnings of this level therefore earn a worker one pension point.

The sum of points at pension age is multiplied by a 'pension value', which was DM47.65 in 1998-99.¹⁴ Low-income workers' points can be increased by up to 1½ times to a maximum of 75 per cent of average earnings of contributors (*i.e.*, 0.75 points) if they have contributed for 35 years. The first three year's contributions before the age of 25 are adjusted upwards to the lesser of 75 per cent of the individual's total pension entitlement or 75 per cent of his or her lifetime average pay. The pension is payable from age 65 with five years' contributions and from age 63 with 35 years'. (Fewer than five years' contributions earn no benefit.) The 'pension value' is updated annually in line with net wages. This indexation procedure affects both the post-retirement benefit and the pre-retirement revaluation of earnings in the benefit formula.

¹³ There is a lower floor of DM530 and ceiling of DM86,400 in the new Länder.

¹⁴ There is currently a lower pension value in the new Länder of DM40.87.

1.5.2 Schemes for public-sector employees

Around 2½ million civil servants are not covered by the general state pension scheme. The civil service pension plan pays 1.875 per cent of final salary for each year of service up to a maximum replacement rate of 75 per cent (*i.e.*, after 40 years' service). No pension is paid for periods of service of less than five years. The normal pension age is 65. There is a minimum pension set as a proportion of the earnings of a low-level public servant. Pensions in payment are uprated in line with the gross civil service pay.

Other public-sector workers — around four million of them — remain in the general state pension scheme but are also entitled to supplementary pensions.

1.5.3 Occupational pensions

Around a quarter of private-sector employees in Germany are covered by occupational pension schemes, although coverage has been declining in recent years. They are mainly provided by larger employers. There are four main types of scheme.

The predominant type of plan is book-reserve financed pensions. Under this type of scheme, there is no independent pension fund, just a pension reserve shown as a liability on the firm's balance sheet. Pensions must, however, be insured through the mutual Pension Insurance Association. Book reserve pensions account for more than half of members of occupational pension schemes.

The second most common type of provision is so-called 'pension funds', covering 19 per cent of those with occupational pensions. These are captive insurers, set up as mutual benefit associations.

The third type of occupational plan is an individual or group policy taken out by the employer on behalf of employees. These schemes, known as direct insurance, account for 14 per cent of occupational pension membership.

The final method of providing occupational pensions is through 'support funds'. These are legally separate institutions, established by a single employer or a consortium of firms. They can be set up either as a limited company or a registered association. Support funds are normally used in conjunction with other plan types to provide occupational pensions.

Book reserves and support funds are most common among larger employer: smaller firms tend to use pension funds or direct insurance.

Pensionable age in occupational plans is aligned with that of the public scheme. More than half of schemes pay only a flat retirement benefit, regardless of the number of years of membership of the scheme (once onerous vesting conditions — ten years' membership — have been met). This rate can, however, vary with the employee's grade. Higher grades tend to get a higher replacement rate to compensate for the ceiling in the public scheme. More than a third of occupational plans pay a flat rate benefit depending on scheme tenure. Only ten per cent of schemes are fully earnings-related.¹⁵ Around two-thirds of schemes pay an annuity income stream with the remainder (predominantly smaller schemes) offering a lump sum alone.

Occupational pensions are much less important in Germany than in Canada, the United Kingdom and the United States, for example. Overall, they account for less than five per cent of pensioners' incomes. Given also the absence of detailed data on the rules of occupational schemes, they have not been modelled.

1.5.4 Social assistance

Although there is no specific minimum pension or means-tested pension in Germany, the elderly can claim the general safety-net benefit (known as 'Sozialhilfe', or social aid). Almost half of social-assistance recipients are elderly. The minimum income is DM625 a month for a single person and DM1,129 for a couple. These are equivalent to 13 and 23 per cent of average earnings respectively.

1.6 Italy

The Italian pension system has undergone two major reforms in the 1990s with further change under discussion. The parameters of the system adopted here are those applying to labour-market entrants after 1996.

¹⁵ These data refer to the old Länder in 1990. Source: StaBA (1995).

1.6.1 *Earnings-related pension*

The normal pension age under the new system will be 65 but it will be possible to draw the pension from age 57, subject to five years' contributions being paid and to actuarial adjustments of the pension value (see below). The new Italian system is similar to so-called 'notional-accounts' schemes, also recently introduced in Latvia, Poland and Sweden.¹⁶

The pension benefit depends on the value of contributions paid. Contributions are uprated in line with a five-year moving average of GDP growth until the year of retirement. The resulting 'notional capital' is then multiplied by a 'transformation coefficient', akin to the annuity rate in a true defined-contribution system. This coefficient varies with the age at which the pension is claimed, from 4.72 at age 57 to 6.136 at age 65.

The minimum pay for contribution purposes is L67,474 a day (41 per cent of average earnings) or the industry-specific minimum wage if higher. Once this threshold is reached, contributions are paid on the whole of earnings, not just the excess over the floor. The maximum earnings for benefits are L141,991,000 a year, nearly 3.7 times average earnings. This applies to labour-market entrants from 1999. Employees' contributions are 8.89 per cent of earnings up to L65,280,000 a year (168 per cent of average earnings) and 9.9 per cent thereafter. The standard employers' contribution rate is 23.81 per cent, but there are many lower rates applying to specific industries and regions. However, individuals' notional accounts in the new system will be credited for the moment with a higher 'equilibrium' contribution rate rather than actual contributions paid.¹⁷

Pensions in payment are indexed to price inflation. The calculation of the transformation coefficient includes an implicit real interest rate of 1.5 per cent. The legislation allows the government to increase pensions in payment more rapidly than prices when GDP growth exceeds 1.5 per cent.

1.6.2 *Social assistance*

The switch to the new notional accounts system led to the abolition of the previous minimum pension as part of the aim of linking benefits more closely to the contributions

¹⁶ See Disney (1999*b*).

¹⁷ According to Hamann (1997), the actual contribution rate (employers' plus employees') was 32 per cent in 1995 compared with the 33 per cent credited. The self-employed are credited with 20 per cent of their income compared with a contribution of just 15 per cent.

that have been made. There remains, however, a social assistance benefit for the elderly (known as the 'assegno sociale' or social allowance). The benefit is available to people over 65. It guarantees a minimum income of L6,593,600 per person (so couples receive double the amount of single people). This minimum is equivalent to 17 per cent of average earnings for a single person.

1.7 Japan

The Japanese public pension system is another two-tier regime. There is also a substantial occupational-pension sector.

1.7.1 Basic pension

The basic pension is payable from age 60 with a minimum of 25 years' contributions. The pension age will be increased in future, to reach 65 for men in 2013 and for women in 2018. Currently, 96 per cent of people of pension age receive some basic pension. To receive a full pension, 40 years' contributions are required. Workers earning below the contribution floor of ¥92,000 a month are exempt. This floor is equivalent to 26 per cent of economy-wide average earnings. Periods of exemption accrue pension at only one third the normal rate. The full basic pension is ¥804,200 a year, 19 per cent of average earnings. Average receipt is rather lower than this level: around ¥560,000 a year. The basic pension is price indexed.

1.7.2 Earnings-related pension

The earnings-related pension, known as employees' pension insurance, pays 0.75 per cent of lifetime average earnings for each year of contributions. The reform enacted in March 2000 will reduce this to 0.7125 per cent for each year of membership, a five-per-cent cut in the accrual rate. There is a ceiling on contributions and earnings eligible for benefits of ¥7,000,000 a year, or 168 per cent of average earnings. Each year of coverage between age 60 and 64 adds an extra ¥1,625 a month. Earlier years' earnings are revalued in line with economy-wide average net earnings. Benefits in payment in the earnings-related tiers will also be uprated in line with prices following the March 2000

reform. Previously, they were indexed to net earnings. The pension is payable from age 60, but this will increase to 65 by 2025, a slower time scale than the increase in pension age for the basic benefit.

1.7.3 *Occupational pensions*

Some 90 per cent of employers also offer some kind of retirement package, but these differ substantially in the type of benefit provided.

First, more than 70 per cent of employers offer a lump-sum retirement allowance, a benefit also used as a severance payment. These are financed through book reserves. Payouts at pension age in 1997 averaged around ¥20 million, or 4.75 times economy-wide average earnings.

Secondly, around 35 per cent of employees are members of tax-qualified pension plans, to which employer contributions are exempted from the corporate income tax. Most of these schemes allow the full benefit to be commuted into a lump sum and annuities are typically ten-year certain (*i.e.*, payable for a ten-year term, even if the beneficiary dies during that period). Only firms with 15 or more employees can establish a tax-qualified pension plan.

Thirdly, about a fifth of employees are covered by an Employees' Pension Fund. Contributions are typically 1.6 to 1.9 per cent each from both employees and employers. These funds are the only scheme allowed to contract out of the state system. Pension funds can contract out if they pay a benefit at least 30 per cent larger than that which would have been received from the state earnings-related scheme. In return, social security contributions are rebated at a rate that varies between 3.2 and 3.8 per cent, averaging 3.5 per cent.¹⁸ Around half of Employees' Pension Funds allow commutation of benefits into a lump sum. The rules allow up to 90 per cent of the pension above the value that would have been received from the state earnings-related scheme to be taken as a lump sum. Benefits taken as an annuity are generally provided as a traditional life annuity. Only employers with 500 or more employees are permitted to establish an Employees' Pension Fund. Employees can also contribute to these funds. Around a third of employees contribute — mainly in larger firms — paying a third of the value of the employer

¹⁸ Note that the National Pension Fund pays for the revaluation of earlier years' earnings and post-retirement indexation of benefits for the people contracted out of this state scheme. The government sets the size of the rebate, depending on the soundness of the fund's finances.

contribution. Employees leaving a plan with less than 20 years' membership can take the accumulate entitlement as a lump sum. This can then be transferred to the pension fund association, which acts as a kind of clearing house, investing the money until the member retires. There is no provision for pension transfers into a new employer's plan. After 20 years, the pension must be deferred (until the employee reaches retirement age).

Finally, nearly 3 per cent of employees are members of occupational plans that are independent of the EPF system.

Analysis of the system is complicated further by the fact that many employers offer more than one type of plan, as Table 3 shows.

Table 3. Coverage of different private pension arrangements in Japan

<i>Tax-qualified</i>	<i>Employees' Pension Fund</i>	<i>Separate occupational scheme</i>	<i>Proportion of employees</i>
x			24.5
x	x		10.0
	x		9.5
		x	1.5
	x	x	0.7
x		x	0.4
x	x	x	0.3

Nearly all of these schemes are defined benefit. However, there has recently been strong growth in defined contribution plans. These include Employees' Property-Accumulating Pension Plans and Smaller Employers Mutual Aid Plans. Employers typically have a mandatory retirement age of 60, and pension benefits are paid from that age. The 1999 pension reform introduces a new defined contribution plan that can be set up either as an individual or a company plan. The latter is modelled on the 401(k) plan of the United States.¹⁹

1.8 Korea

The Korean public pension scheme was introduced relatively recently. Mandatory severance payments can also be viewed as a way of providing for retirement incomes.

¹⁹ See Takayama (2000*a,b*) for a detailed presentation.

1.8.1 Public pension

The scheme is earnings-related. Benefits accrue at the rate of 1.5 per cent of earnings per year of membership. The earnings measure used in the formula is the average of individual lifetime average earnings and economy-wide average pay. This provision introduces an element of redistribution into the system. There is, however, no ceiling to pensionable pay.

The pension is available from age 60 provided the individual has contributed for twenty years or more. An actuarially reduced early pension can be drawn from age 55. The benefit is indexed to prices after retirement.

1.8.2 Severance pay

The mandatory severance payment is one months salary per year of service. This is paid as a lump sum. However, to compare the value of this benefit with other countries, the modelling converts this lump sum to an annuity using population life tables averaged across four OECD countries.

1.9 Netherlands

The Netherlands has a two-tier pension system, consisting of a flat-rate public scheme and earnings-related occupational plans. Although there is no statutory obligation for employers to offer a pension scheme to their employees, industrial-relations agreements mean that 91 per cent of employees are covered. These schemes are therefore best thought of as quasi-mandatory.

1.9.1 Basic pension

The public pension in the Netherlands is a flat-rate benefit, payable from age 65. The full benefit is payable with 50 years' residence between age 15 and 64 and, if resident and earning, if contributions have been made. The pension value is reduced for any gaps in residency or the contribution record. People earning less than NLG8,617 a year (15 per

cent of average earnings) are exempted from contributions. There is also a contribution ceiling of NLG56,792, just over twice average earnings. The floor and ceiling are set equal to the thresholds of the first bracket of the income tax schedule.

The pension benefit was NLG1684.70 a month for a single person and NLG2324.54 a month for a couple in 1998-99. These benefit levels are equivalent to 35 and 49 per cent of average earnings respectively. The benefit value is updated biannually in line with the net minimum wage.

1.9.2 Occupational pensions

The Netherlands also has a private pension system with broad coverage. The system consists of 64 industry-wide schemes, of which 95 per cent are defined benefit. Dutch companies are free to opt out of these plans if they offer their own scheme with equivalent benefits. There are around 866 of these single-employer plans. A further 30,000 mainly smaller employers offer schemes operated by insurance companies on their behalf.

The pension age in these schemes is 65, although people are ineligible to join until they reach age 25. Most schemes give 1.75 per cent of final salary for each year of service, giving a replacement rate of 70 per cent after a complete 40-year career. The law also allows for average-salary plans giving 2.25 per cent of average pay for each year of service. Three-quarters of plans are based on final salary; the rest are mainly average-salary schemes.

Broad, industry-wide coverage of schemes reduces the problem of lack of portability. Although there is no legal requirement to index pension rights of people leaving a scheme before retirement, most schemes offered full price indexation. Regulations now stipulate immediate vesting and transferability of pension rights between schemes: the new employer must assume the previous employer's pension liability. The portability regime is therefore similar to the system in the United Kingdom, discussed below. Benefits in payment are also typically indexed to earnings, although there is no legal updating requirement.

Occupational pensions are integrated with the public pension system. Tax rules allow a maximum benefit of 70 per cent of final pay from both public and private systems,

so private benefits are reduced by the value of the public pension entitlement, a process known as ‘franchising’.

The franchise interacts in complex ways with the state pension. A married man with a non-working wife would be assumed to receive nearly NLG27,900 from the public pension system (NLG2324 x 12). At the earnings of the average production worker (NLG57,500), his total pension benefit would be capped at NLG40,250 or 70 per cent of pre-retirement pay. The private pension benefit would be the difference between this cap and the public pension, NLG12,350. A single person with the same level of earnings would get the same pension, but would get only NLG20,200 from the public scheme with a larger top up from the private plan. A couple each earning half of the average production worker’s pay would both have their pension reduced by the married couple’s benefit. Each would get 70 per cent of the difference between their earnings (NLG57,500/2 = NLG28,750) and the public pension, *i.e.*, (NLG28,750 — NLG27,900) x 70% = NL600. The couple’s total pension would therefore be NLG29,100, giving a replacement of just 51 per cent.

1.10 Norway

The Norwegian public scheme has three components. The first is a flat-rate, basic pension. For workers with small overall pension entitlements, this can be topped up with a special supplement, providing a minimum pension guarantee. Finally, there is an earnings-related scheme. The pension age is 67.

1.10.1 Basic pension

The full basic pension in 1999 was NKr 45,370, equivalent to 17 per cent of average earnings. Forty years’ contributions are required to receive the full amount; the benefit is proportionally reduced for shorter contribution histories.

1.10.2 Income-tested supplement

The special supplement is 79.3 per cent of the basic pension, giving a total minimum pension of around NKr 81,350, or just over 30 per cent of average earnings.

1.10.3 Earnings-related pension

Since the basic pension replaces the first slice of earnings, the earnings-related scheme only covers pay above the value of the basic pension (known as the base amount). The earnings-related scheme has a progressive formula. Earnings between the base amount and six times the base amount are replaced as a 42 per cent rate. Between six and 12 times the base amount, the replacement rate is one third of that level (that is, 14 per cent). Given that 40 years' contributions are needed for a full pension, these are equivalent to annual accrual rates of 1.05 and 0.425 per cent respectively. The first threshold, where the accrual rate declines, is a little over average earnings (102.5 per cent). The ceiling on earnings eligible for benefits is therefore a little over double average earnings (205 per cent).

1.11 Spain

The Spanish public pension system consist of a single, earnings-related benefit. The benefit accrues according to a schedule. After 15 years' contributions, it is 50 per cent of the earnings base. Over the next 10 years, an extra three per cent is accrued per year, followed by two per cent per year thereafter. The maximum accrual is 100 per cent, reached after 35 years' contributions. The earnings base is pay over the last 15 years, uprated in line with prices, apart from the last two years. This means that the replacement rate relative to final salary is less than 100 per cent. On the standard assumptions for earnings growth and price inflation, this is calculated to be 88 per cent.

1.12 Sweden

The Swedish pension system has also recently undergone fundamental reform. The new regime, introduced in 1999, applies to people aged 45 or under at the time of reform. Older workers — aged between 45 and 62 — will be covered proportionally by the old and the new systems. The modelling covers only the new system, which has three tiers.

1.12.1 *Earnings-related pension*

The new earnings-related scheme, known as the income pension, is based on ‘notional accounts’.²⁰ Contributions of 16 per cent of pay will be credited to the notional account, and will then be uprated in line with a three-year moving average of economy-wide earnings.²¹ Contributions are only levied when earnings exceed a floor of SKr8,952. There is a ceiling to benefits and employee contributions of SKr279,750, but there is no cap on employer contributions (even though pension rights do not accrue on earnings above the ceiling).²² There is provision for ‘imaginary’ contributions for periods of unemployment, sickness, education and caring responsibilities. These are paid by the state rather than the employer on the basis of the value of the out-of-work benefit. Some social security contributions can be levied on the benefit value with the state making the total up to 18.5 per cent.

At retirement, the accumulated notional capital will be converted to an annuity. The calculation of the annuity coefficient will depend on individual retirement age and contemporaneous life expectancy (based on the previous five years’ unisex mortality table). It does not therefore aim to project the actual life expectancy of the cohort and so excludes any future mortality improvements. A real return of 1.6 per cent a year will be assumed in this calculation. Retirement will be possible from age 61. Illustrative forecasts of the annuity coefficient at age 65 are 15.4 for 2000 rising to 15.9 by 2020. This implies a pension of 6.5 per cent of accumulated notional capital, falling to 6.3 per cent in 2020. The annuity coefficient is currently 18.2 for retirement at 61 and 13.0 if the pension claim is deferred to age 70.

After retirement, pensions will be uprated in line with average earnings less a ‘growth norm’ of 1.6 per cent. So if real wage growth falls short of the norm, the real value of pensions will fall. For example, assume inflation is 2.5 per cent and real wages grow by 0.5 per cent. The pension will be increased by 1.5 per cent, equivalent to a real cut of 1 per cent.

²⁰ Notional accounts are designed to mimic a defined contribution scheme, but are in fact nearly equivalent to a traditional pay-as-you-go defined benefit scheme. For example, Scherman (1999), the director of the Swedish National Social Insurance Board points out: “The reality of the new Swedish system is that contributions, as the law is formulated, are set independently of pension entitlements just as in every PAYG defined benefit scheme... This law as such does not prevent an increase (or decrease) in contributions without affecting pension rights.” See also Disney (1999*b*).

²¹ The index includes average pensionable earnings (and so excludes pay over the ceiling). It also includes the value of early retirement pensions.

²² Note that the floor and ceiling are defined technically as 24 per cent and 7.5 times the base amount (of SKr37,300) respectively.

There is also a ‘balance mechanism’ to protect the system’s finances at times of pressure. If total assets (the buffer fund plus contribution revenues) fall below total liabilities (pension benefits) then both the indexation of pensions in payments and the rate of return credited to the notional accounts of workers are reduced.

1.12.2 Personal pensions

A further 2.5 per cent of earnings will be paid into individual pension accounts, known as the premium pension. People have a broad choice of where these funds are invested. At retirement, a new public agency will be responsible for converting the accumulated balance into an annuity. Alternatively, people will be able to choose a variable or ‘participating’ annuity, where their funds continue to be invested by their chosen fund manager. These annuities do not have a guaranteed value but compensate for this risk with a higher expected rate of return.

1.12.3 Income-tested pension

Low-paid workers will be protected by a ‘guarantee pension’. This is essentially an income-tested top-up to people with low levels of notional-accounts benefit. Eligibility for the guarantee pension will be earned with three years’ residency. Maximum pension is earned with 40 years’ residency and is reduced proportionally for shorter periods of residency. For a single person the guaranteed benefit is SKr77,958, or 36 per cent of average earnings.²³ The guarantee pension is withdrawn at 100 per cent against the first SKr47,000 (21 per cent of average earnings) of income from the earnings-related pension, thereafter at 48 per cent. Only when earnings-related pension income exceeds SKr114,500 — or 51 per cent of average earnings — is entitlement to the guarantee exhausted.²⁴ Simulations suggest that around 40 per cent of the pensioner population will be eligible for the guarantee pension.²⁵ The guarantee level will be price indexed, implying increased reliance on the earnings-related component over time. General social assistance programmes protect people who do not meet the residency requirements for a guarantee pension.

²³ Again, there is a general social assistance scheme that will protect the elderly who have spent most of their working lives in other countries. The social assistance targets a much lower income level: less than half of the minimum pension.

²⁴ Note that the thresholds are defined formally as 1.26 and 3.07 times the base amount.

²⁵ Sundén (1999).

1.12.4 Occupational pensions

Sweden also has employer-provided pensions with broad coverage: the four major occupational schemes together cover 90 per cent of employees. The four main schemes are:

- a plan for private-sector, blue-collar workers (SAF-LO)²⁶
- a plan for private-sector, white-collar workers (ITP)
- a plan for employees of the central government
- a plan for employees of local government

Pensions for blue-collar workers are managed by a mutual insurance organisation (AMF). They are defined benefit and partially funded. White-collar workers' pension can be provided through a similar mutual company (SPP). Some employers make balance-sheet provisions through book reserves, accounting for 40 per cent of workers in the ITP programme. In this case, another organisation (PRI) administers pensions in payment and provides actuarial estimates of future pension liabilities. Finally, a small number of large companies have separate pension funds, along the lines of occupational schemes in the United Kingdom and United States. While private-sector employers provide occupational schemes voluntarily, they are negotiated as part of collective agreements and so are probably best described as 'quasi-mandatory'. They are compulsory from the point of view of the employee, who must join a scheme if one is offered. The public-sector plans, managed by local or central government bodies, are pay-as-you-go financed. Table 4 shows the division of occupational pension coverage, totalling 2.85 million in 1999, between the four main plans.

²⁶ This new scheme was introduced in 1995 to replace the old STP programme. New scheme entrants after 1995 (*i.e.*, those aged 28 or under at that time) receive benefit only under the new scheme. Transition provisions for existing STP members give a mix of benefits under the old and new regimes.

**Table 4. Occupational pension coverage
in Sweden by scheme, 1999**

Type of worker	Scheme	Coverage (% of total)
Blue-collar, private sector	STP/SAF-LO	35
White-collar, private sector	ITP	21
Central government	—	9
Local government	—	35

The standard pension age for occupational plans is 65, and there is a minimum entry age of 28.

The new SAF-LO scheme for blue-collar workers, which replaced the defined benefit STP plan in 1995, is defined contribution. Employers contribute two per cent of employees' salaries to the mutual insurance organisation managing the scheme, up to the same ceiling as the state scheme (around 130 per cent of average earnings). Total contributions, including those to pay for the old STP plan, averaged 3.15 per cent in 1996, although some employers pay as much as five per cent. Workers can choose either to invest the money in a mutual fund of their choice or to opt for a guaranteed nominal return, typically three per cent. They can switch funds once a year, either between the two investment options or between different mutual-fund providers.

The ITP scheme for white-collar workers has also been reformed recently. In 1999, the pension formula shifted from pure defined-benefit to a mix of defined benefit and defined contribution. The defined benefit arm offers ten per cent of final salary on earnings up to the ceiling of the state pension system (around 130 per cent of average earnings). Between this ceiling and a threshold of around 3.5 times average earnings, the pension pays 65 per cent of final salary. From around 3.5 to 5.2 times average earnings, the accrual rate is 32.5 per cent, with no pension entitlement on earnings above 5.2 times economy-wide average pay.²⁷ The ITP scheme therefore is a top-up to the state pension, paying much larger benefits to higher- than to lower-paid workers. A full pension is earned with 30 years' contributions between the ages of 28 and 65. Shorter tenures result in a proportionally reduced pension. The normal pension age is 65, but actuarially reduced benefits are available from age 62.

²⁷ These thresholds are again formally defined in terms of the base amount: 7.5, 20 and 30 times the base amount respectively.

White-collar workers earning above the state-pension contribution ceiling can opt out of the main, defined-benefit ITP scheme. Instead, they take out a defined contribution plan with a financial-services company, and their employer continues to contribute.

Finally, ITP members also have a supplementary, defined contribution plan. As in the SAF-LO, workers can choose between a guaranteed nominal return on contributions (again typically three per cent a year) or to invest the contribution in a mutual fund of their choice. There are similar restrictions on switching.

The public-sector schemes cover all full-time workers and part-timers that work 40 per cent or more of the full working week. The pension plan for central-government employees has the same accrual structure as the ITP plan, paying ten per cent of final salary below the ceiling for the state pension, and a higher replacement rate for higher earnings. 'Final' salary is defined as the average of the last five years before retirement. Although the normal pension age is typically 65, 30 years' contributions between age 28 and 65 are sufficient for a full pension. Workers can retire on a full pension from age 60 if they meet the contribution condition. The benefit is reduced proportionally for less than full contribution records. Although public plans are pay-as-you-go financed, 'notional' contributions of around six per cent of earnings are levied. In addition, there is a defined contribution top-up pension, to which the government contributes 1.7 per cent of pay.

There has been a marked shift from defined benefit to defined contribution formulae in Sweden's occupational pension schemes. In the main, these are designed as top-up schemes to the state pension and are mainly targeted at high-paid workers. Currently, they account for ten per cent of pensioners' incomes. Pensions are portable between employers within a particular programme and between the four main schemes.

1.13 *Switzerland*

The Swiss mandatory pension system has two tiers. The first is a public scheme which, although earnings-related, has a progressive formula. The second is a system of mandatory occupational pensions. There is also an income-tested supplementary benefit.

1.13.1 Public pension

The public pension is based on average lifetime earnings. If this figure is less than SFr 36,180, then the entitlement is SFr 8,926 plus 26 per cent of average lifetime earnings. For lifetime earnings above the threshold, the entitlement is a flat SFr 12,542 plus 16 per cent of average lifetime earnings. There is a minimum pension of SFr 12,060 and a maximum pension of twice that level. These are equivalent to 20 and 40 per cent of average earnings respectively. The maximum benefit is reached when earnings are SFr 72,360, equivalent to 120 per cent of economy-wide average earnings. Pensionable age is currently 65 for men and 62 for women, although the latter will increase to 64 by 2005.

1.13.2 Occupational pensions

The system of mandatory occupational pensions was introduced in 1985. The system is built around defined credits to an individual's pension account.²⁸ These vary by sex and age, as shown in Table 5. When a man reaches 65 after a full career in the system, he will have accumulated a sum of credits of 500 per cent of earnings. The system has a minimum annuity rate of 7.2 per cent that is applied to this notional capital sum, giving a replacement rate of $(500 \times 7.2 =)$ 36 per cent.

Table 5. Credits to individual pension accounts by age, Switzerland
(per cent of 'co-ordinated' earnings)

Age		Annual credit
Men	Women	
25-34	25-31	7
35-44	32-41	10
45-54	42-51	15
55-64	52-61	18

Source: Federal Office of Social Insurance

The defined credits (and hence the replacement rate) apply only to 'co-ordinated' earnings. This is pay between the maximum pension of the public scheme (SFr 24, 120) and three times that level (SFr 72,360). These thresholds are equivalent to 40 and 120 per cent of average earnings. Note that the ceiling for pensionable pay is the same in the

²⁸ Many, if not most, employees are in plans that offer benefits above this mandatory level. However, the modelling focuses only on mandatory benefits.

public scheme and in the mandatory occupational pension sector. The age of entitlement is also the same as the public scheme.

1.13.3 Income-tested benefit

The supplementary benefit scheme aims to give a minimum pension income to single people of at least SFr 16,460, equivalent to 27 per cent of average earnings.

1.14 United Kingdom

The United Kingdom has a complex pension system, which mixes defined benefit and defined contribution formulae and public and private provision. The public scheme has two tiers, but most workers 'contract out' of its second tier into private pensions.

1.14.1 Basic pension

The first tier of the system is the basic state pension, worth £66.75 in 1999-00. This is a flat-rate benefit, payable to all people of pensionable age who meet the contribution condition. There is a dependants' supplement of £39.95 a week payable when one partner has no basic pension entitlement of their own. The single person's pension is worth 20 per cent of average earnings; the couple's pension 32 per cent. Pension age, currently 60 for women and 65 for men, will be equalised at 65 from 2010. The simulations here assume the medium-term pension age of 65 for both sexes. People need to have paid social security contributions for around nine-tenths of their potential working lives (44 years). However, the apparent severity of this test is reduced by credits for periods in education and in receipt of certain social security benefits for unemployment or disability. For people out of the labour market caring for children or sick relatives, home responsibilities protection, introduced in 1978, reduces the number of years of contributions needed to get the full pension. People with an incomplete contribution record can claim a proportionally reduced pension, subject to a minimum of a quarter of the full pension level. The Government Actuary (1995) assumes that these and other provisions will increase the proportion of women with their own entitlement to the basic pension from 70 per cent in 1995-96 to 100 per cent from 2010-11 onwards. The average rate of benefit paid is expected to increase from 73 per cent of the standard rate in 1995-96

to 83 per cent in 2010-11 and 91 per cent in 2020-21. The basic pension has been uprated annually in line with prices since 1981.

1.14.2 Earnings-related pension

The second tier of the system offers individuals a choice of provision. The state earnings-related pension scheme, known by its acronym Serps, pays a defined benefit pension. Note that a reformed version of the Serps scheme, to be renamed the state second pension, will shortly be introduced. However, the government has left open the long-run structure of the new scheme, which is likely to move towards a flat-rate formula. The new scheme will, in its early stages, increase the accrual rate for low earners. But without detailed, long-term parameters, the modelling looks only at the old Serps scheme.²⁹

The 1988 pension reform reduced the target replacement rate under Serps from 25 to 20 per cent. This will be fully effective from 2010-11. The scheme also accelerated accruals for earlier cohorts, so that a full pension could be earned after just 20 years. From 2027-28, all new retirees will have spent a full working life in the scheme, and the accrual rate will be 20/49 or 0.41 per cent for each year of membership. Serps is calculated on average lifetime salary, with earlier years' pay uprated in line with average economy-wide earnings. The benefit is then price-indexed after retirement. Serps benefits are earned only on 'band earnings' between the lower and upper earnings limits of the social security system. In 1998-99, the floor was £66 a week and the ceiling £500 a week (20 and nearly 150 per cent of average earnings respectively). This gives a maximum pension of a little over 25 per cent of economy-wide average earnings in the long-term. The contribution floor is also the minimum contribution level to receive the basic pension. The earnings limits are uprated annually in line with the increase in the basic pension. Since 1981, therefore, they have been price indexed.

1.14.3 Occupational pensions

Most people, however, are contracted out of Serps, into either an occupational plan, provided by an employer, or a personal pension, bought from a financial-services company, as indicated in Table 6. Occupational schemes are mainly defined benefit, but there has been rapid growth since the mid-1980s in defined contribution occupational

²⁹ See Agulnik (2000) and Disney, Emmerson and Tanner (1999) for a discussion of the reform.

plans, albeit from a very low base.³⁰ Regulatory changes mean that many employers now prefer to offer their employees a group personal pension rather than a defined contribution occupational plan. The aggregate value of employer contributions to personal pensions in their employees' behalf grew two-and-a-half fold between 1994-95 and 1998-99.

Both employers and employees pay a lower rate of social security contributions when contracted out and the employee foregoes their Serps entitlement. In return, defined benefit schemes must guarantee a minimum pension and defined contribution plans must levy a minimum contribution.

Table 6. Second-tier pension provision in the United Kingdom, 1995-96

	<i>per cent of total coverage</i>
Defined benefit occupational	
Private sector	19
Public sector	18
Serps	35
Defined contribution	
Private-sector occupational	1
Personal pension (including group schemes)	25

Note: Occupational schemes refer only to those contracted out of Serps. Around 1 per cent has a contracted in defined contribution occupational plan on top of Serps and 2 per cent are members of a contracted in defined benefit occupational plan

Source: Department of Social Security (1998b)

Defined benefit occupational pension schemes provide a pension usually related to years of membership of the scheme and some measure of final salary when covered by the plan.³¹ Most public-sector schemes pay $1/80$ th of earnings per year of membership, plus $3/80$ ths as a lump sum. So the benefit after a full 40-year career would be half of final salary as an annuity plus $1\frac{1}{2}$ times final salary as a lump sum. Private-sector schemes are more diverse. Around 60 per cent pay $1/60$ ths of final salary. But taking a lump sum (known as commutation) reduces the annuity value. Around a fifth are more generous than this while around 7 per cent pay less than $1/60$ ths or $1/80$ ths plus a lump sum. More than a quarter of private occupational schemes are 'integrated' with the state scheme, reducing benefits to

³⁰ See Disney (1995) for a discussion.

³¹ Data in this section are taken from the National Association of Pension Funds annual survey. See also Disney and Whitehouse (1994, 1996) and Government Actuary (1996).

take account of state pensions received. Most cut the pension by the value of the basic state pension or the lower earnings limit (which are broadly similar by law). Other methods of adjustment are more complicated. For someone on average earnings in a $1/60$ ths scheme, integration will typically reduce a full-career pension by around a fifth. The defined benefit pension modelled pays $1/80$ ths — the minimum required to contract out of Serps — but is not integrated with the state pension.³² Benefits after retirement must be limited price indexed to a ceiling of five per cent. However, all public-sector and many private-sector plans are fully price indexed.

1.14.4 Personal pensions

The government introduced in 1988 the option of contracting out of Serps into a personal pension, open to occupational schemes since the advent of the scheme. Table 6 shows that a quarter of employees now has a personal pension. Personal pensions are individual retirement-savings accounts, mainly sold by life insurance companies and banks. In return for foregoing their Serps entitlement, people pay a lower rate of social security contribution. But this contribution rebate must be invested into the personal pension scheme. The pension is defined contribution: the ultimate value depends on contributions made, the investment returns earned and the level of annuity rates when the member retires.

The government sets the social security rebate, usually every five years, on the advice of the Government Actuary. The rebate is designed as fair compensation for the loss of Serps rights. The Government Actuary calculates the value of Serps and, with assumptions about investment returns and administrative costs, the contribution to a personal pension that should deliver the same level of pension benefit. The rebate has varied with age since April 1996. As the Government Actuary's assumptions are reasonable, the value of a personal pension should be equivalent to the Serps benefit foregone. A model of mandatory personal-pension benefits, therefore, produces the same results as a model of Serps.³³ Around 45 per cent of personal pension members contribute only the mandatory minimum to their plan.

³² Disney and Whitehouse (1994, 1996) model defined benefit pension values in a range of illustrative schemes with different benefit formulae.

³³ When the scheme was introduced, this was true on average. But because of the effect of compound interest and Serps reforms which affected different cohorts' benefits in different ways, younger workers were over-compensated and older workers under-compensated for contracting out. This had a powerful adverse selection effect — only younger workers contracted out — with a significantly negative effect on the public

1.15 *United States*

The United States has a publicly provided pension benefit with a progressive formula, and different types of occupational scheme with broad coverage.

1.15.1 *Public pension*

The public pension in the United States is payable from age 65. The benefit is based on covered earnings between age 21 and age 62. Earlier years' earnings are revalued in line with economy-wide average earnings. The five years with the lowest earnings are excluded from the average. The ceiling for both contributions and benefits is \$72,600 a year — 2½ times average earnings — uprated annually in line with economy-wide earnings. The benefit formula is progressive. The first \$531 a month of average revalued earnings attracts a 90 per cent replacement rate. The band of earnings between \$531 and \$3,202 a month is replaced at 32 per cent. These thresholds are 37 and 220 per cent of average earnings respectively. A replacement rate of 15 per cent applies between the latter threshold and the earnings ceiling. A 50-per-cent dependants' addition is available to married couples where secondary earners have built up a smaller entitlement.

1.15.2 *Social assistance*

The United States provide a means-tested benefit for the elderly³⁴ known as Supplemental Security Income. Single people over the age of 65 can be eligible for up to \$6,144 a year depending on assets and other income. The benefit rate for couples is \$9,228 (50 per cent higher than the rate for singles). These are equivalent to around 21 and 32 per cent of average earnings respectively.

The asset tests are strict: single people are limited to \$2,000 worth of assets and couples to \$3,000, excluding personal belongings, a home, a car, funeral insurance and life insurance (the last two up to \$1,500 value). There is a small (\$20 a month) 'disregard' in

finances. This is no longer the case, now that the rebate is age-related. See Disney and Whitehouse (1992a,b) and Whitehouse (1998) for a detailed explanation.

³⁴ Disabled people of working age are also covered by this scheme.

calculating the entitlement. The benefit is then withdrawn at a 100 per cent rate against income above this level.

The modelling and analysis of these benefits is complicated by the fact that states³⁵ can supplement the federally determined minimum. Twelve states pay only the federal minimum.³⁶ Some 28 states administer their own system while 12 offer supplements that are operated by the federal Social Security Administration. The average additional payment in these 12 states is 13 per cent for single pensioners and 18 per cent for couples (Table 7).

Table 7. State-level maximum supplements to Supplemental Security Income

	<i>Supplement, per cent of Federal minimum</i>	
	<i>Single</i>	<i>Couple</i>
California	35	60
Delaware	27	58
Hawaii	1	1
Massachusetts	25	26
Nevada	7	10
New Jersey	6	3
New York	17	14
Pennsylvania	5	6
Rhode I	13	16
Utah	0	1
Vermont	11	14
Washington	5	3

Note: Washington has two separate regional regimes: the higher supplement is shown. Delaware's and Montana's supplements apply only to people in care
Source: Social Security Administration (2000b)

1.15.3 Occupational pensions

The majority of occupational pension schemes in the United States are final-salary defined benefit schemes. These cover 56 per cent of occupational pension members, with 23 per cent in flat-rate defined benefit plans (which pay a fixed amount for each month of

³⁵ Using the term 'state' to include the 50 states as formally defined plus the Federal District of Columbia and the North Mariana Islands.

³⁶ Note that four of these offer supplements to the disabled but not to elderly beneficiaries.

coverage), 11 per cent in average-salary schemes and six per cent in defined contribution plans.³⁷

The definition of ‘final salary’ varies, but the most common formula is the best consecutive five years’ earnings, accounting for 65 per cent of members. Accrual structures are complex, with only 37 per cent in schemes having a single accrual rate, the most common being between 1.25 and 1.75 per cent. In 41 per cent of schemes, the accrual rate varies with the level of earnings and in another eight per cent, with the number of years of service. Around half of plans are integrated with social security, usually by using an ‘excess formula’ that applies a lower accrual rate to earnings covered by social security. The most common normal pension age is 65, although a number of plans only allow retirement once a minimum service level has been achieved.

Following a series of regulatory changes, nearly a third of schemes now have no minimum age or service requirement for eligibility to join the plan. Another third have a minimum service requirement of one year or less and a final third have a minimum entry age of 21 and a one-year’s-service requirement. Schemes are voluntary, but participation rates are high, averaging nearly 80 per cent of full-time employees. Vesting is now most commonly achieved with five year’s membership: these schemes account for 85 per cent of members.

Post-retirement indexation of benefits is rare: just 3 per cent of members are promised automatic cost-of-living increases and only 4 per cent of schemes have granted discretionary increases in the last five years. Fewer than one in four schemes allow any of the pension to be taken as a lump sum.

2. Empirical results: gross pension benefits

The main results of the model of pension benefits in the 15 countries are set out in a series of charts and tables. The underlying assumptions were set out in the introduction. To recap briefly, the models assume a full-career worker retiring at the normal pensionable

³⁷ These data are taken from Mitchell (2000). Note that the Department of Labor (1999) reports that defined benefit schemes cover only 49 per cent of members of occupational plans, with 51 per cent in defined contribution schemes alone and 32 per cent in both a defined benefit and a defined contribution plan. Note that 401(k)s are not counted as occupational schemes.

age under the parameters of today's pension system (including the full effect of any reforms legislated).

The first set of charts, Figure 1, shows the value of pension benefits as a proportion of economy-wide average earnings. These are presented for people earning various levels of the economy-wide average, ranging from 0.3 to five times the average. (The relatively high upper figure was chosen to exceed the benefit ceilings in all countries. Most workers will of course lie well to the left of the charts.) The charts are to the same scale with the exceptions of Finland, Italy, the Netherlands and Sweden. The absence of a benefit ceiling to mandatory earnings-related means that pension entitlements for higher-income workers are larger than in the other countries. It is important to be aware of these differences in the vertical scale when making cross-country comparisons.

The second set of charts, Figure 2, shows the value of pension benefits as a 'replacement rate', that is, as a proportion of the individual's pre-retirement earnings. Here, the vertical scales have all been capped at 100 per cent: in some countries, benefits for low-income workers can exceed pre-retirement earnings.

The two measures presented in Figures 1 and 2 respectively are complementary: they reveal different features of the structure of pension benefits. Summary tables give the value of total pension benefits at selected levels of earnings. Again, these are shown relative to economy-wide average earnings and to individual pre-retirement pay.

The means test for the age pension in **Australia** begins when other income exceeds a relatively low 'free area' equivalent to seven per cent of economy-wide average earnings. The age pension is withdrawn at 50 per cent against the additional income from the superannuation guarantee. When the age pension is exhausted, all income derives from the superannuation guarantee, giving a straight ray through the origin for the pension value in Figure 1 and a horizontal line in Figure 2. The result is a very progressive, targeted pension system, as evidenced by the high pension replacement rates afforded to low-income workers.

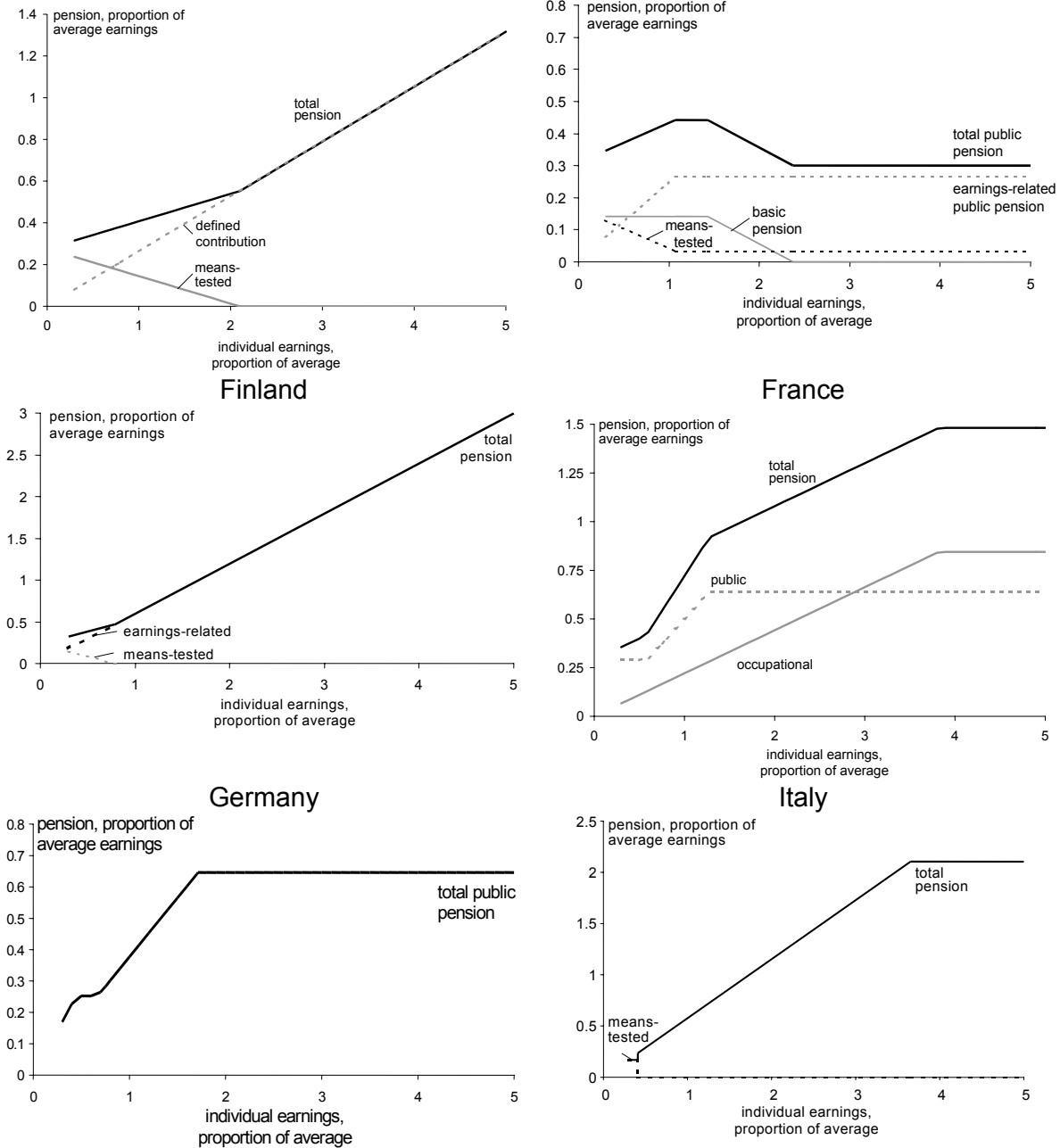
In **Canada**, the basic pension is paid at a flat rate, but withdrawn once earnings reach a particular threshold. The earnings-related pension naturally increases with earnings, but is flat once pay reaches the benefit ceiling, just over economy-wide average earnings. The income-tested component is withdrawn at a lower income level than the basic scheme. However, in the absence of any private pension or investment income (a rather implausible assumption), it is still payable to higher earners. Adding the components together

produces an interesting pattern. The value of the total pension at first increases with pay because of the earnings-related pension. Once the pay threshold for the earnings-related scheme is reached, the pension value reaches a plateau. Then the withdrawal of the basic pension kicks in. Once the basic pension is exhausted, the overall pension is flat, worth 30 per cent of economy-wide average earnings.

Looking at the pension value as a replacement rate (Figure 2), the means-tested and basic pensions together produce a rapidly declining replacement rate as earnings increase. The earnings-related pension offers a flat, 25-per-cent replacement rate at first, but the replacement rate declines once the earnings threshold is reached. Adding the components together, the Canadian public-pension system is highly progressive, paying much higher replacement rates to low-income than to high-income workers. Indeed, replacement rates for the highest-income workers are below ten per cent. Overall, the curve is very close to a rectangular hyperbola, reflecting the fact that the system as a whole pays a broadly constant benefit at different earnings levels.

In **Finland**, the income-tested pension is exhausted at three-quarters of average earnings and only earnings-related pension benefits are received above that level of earnings. This means that the picture is much simpler than Canada, for example. The absence of a ceiling to pension benefits and pensionable earnings means that the value of the pension continues to grow across the earnings range. The contrast with the Canadian system is also clear from the individual replacement rates. The income-tested pension boosts the replacement rate at lower level of earnings, but above the threshold of three-quarters of average pay, benefits are flat at 60 per cent of individual earnings. The overall benefit structure is progressive because of the additional income-tested pension paid to people with the lowest incomes.

Figure 1. Mandatory pension benefits as a proportion of economy-wide average earnings by individual earnings, 15 countries
Australia
Canada
Finland
France
Germany
Italy



With a single pillar, the public pension in **Germany** is somewhat simpler to model than two-tier public systems, such as those in Canada and Finland. Nevertheless, the boost to pensionable pay of the lowest workers in the benefit formula gives the public pension a progressive formula. Up to half of average earnings, pensionable pay is increased to 1½ times its actual level. However, beyond this threshold there is a plateau, because the rules prohibit an increase in pensionable pay beyond three-quarters of the average. Unlike the

Finnish system, the German scheme has a ceiling to pensionable earnings, which means that the value of the pension is flat once earnings reach around one-and-three-quarter times the economy-wide average. Note that the pension entitlement at 30 per cent of average earnings is sufficient to preclude entitlement to social assistance. The addition to pensionable pay for lower-income workers results in a higher replacement rate against individual earnings (Figure 2). The curve flattens out once earnings reach three-quarters of the average and the individual is longer entitled to this supplement. The replacement rate then declines once earnings exceed the benefit ceiling.

The pension values shown here are below those typically reported in national studies of Germany. This is because of the treatment of pre-retirement indexation of earnings in the defined benefit formula. In most other countries, earlier years' earnings are uprated in line with economy-wide gross pay. In Germany, this indexation is effectively to net wages. Since contribution rates for the pension scheme are forecast to rise substantially in the future, the modelling assumes that net wages grow at 1.5 per cent a year, slower than the two per cent a year growth assumed for gross earnings. The overall effect is that replacement rates are around 85 per cent of the value that they would be with indexation to gross earnings.

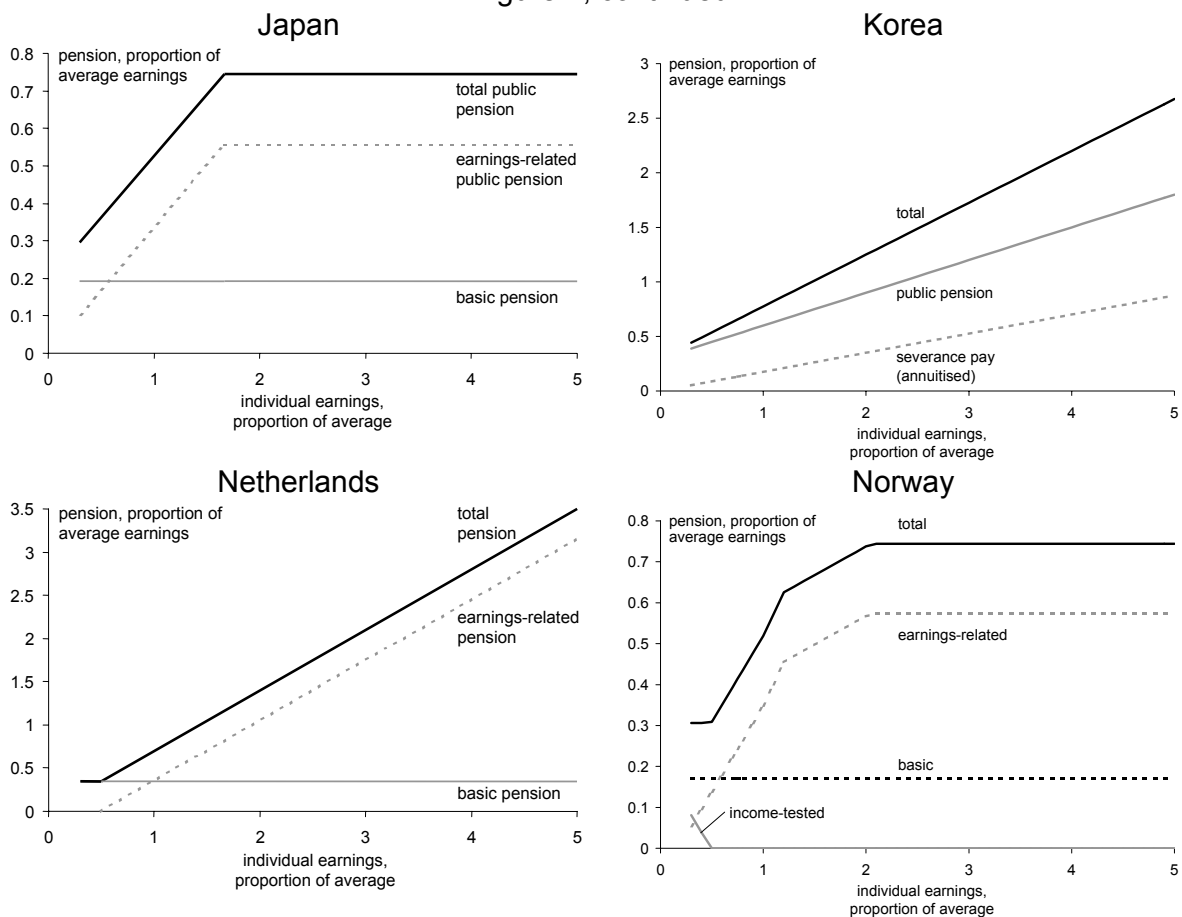
As in Germany, the new public pension system in **Italy** has just a single tier. Pension benefits at lower earnings are zero, because of the relatively high minimum applied both to contributions and benefits. Then there is a jump, because contributions are levied and benefits are paid in respect of the whole of earnings once pay reaches the threshold. At the other end of the salary scale, the pension ceiling — at 365 per cent of economy-wide average earnings — is also higher than limits in other countries. Indeed, the pattern of pension level with earnings is much closer to systems without ceilings — Finland, the Netherlands and Sweden — than it is to other countries with benefit limits. The relatively high floor to pension contributions means that the very lowest earners considered on the chart depend on social assistance for their income. The social assistance level is, however, below the pension that would be earned for a full career of contributions at the contribution floor. This results in a jump in the value of total benefits at the floor.

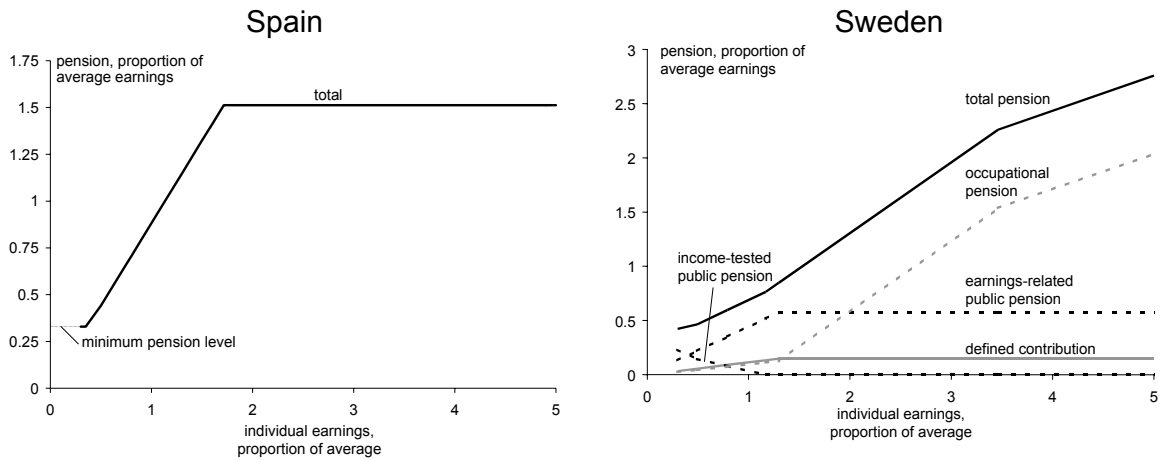
The pattern of the individual replacement rate against earnings is also rather different from other countries. There is a zero replacement rate from the public pension at the lowest levels of earnings. However, social assistance ensures a minimum total benefit for the lowest income groups. Since this is set at an absolute level, the replacement rate declines until the contribution floor of the notional-accounts system is reached. The

relatively high earnings ceiling also means high replacement rates at higher levels of pay. The strengthening of the relationship between contributions and benefits in the new notional accounts scheme results in a less progressive structure of benefits than in countries with large basic, flat-rate or means-tested public programmes.

At the lowest income levels in **Japan**, most of the total pension benefit comes from the basic scheme. But beyond three-quarters of average earnings, the earnings-related pension dominates. There is, however, a ceiling to earnings-related pensions which caps pension benefits for people earning above 170 per cent of the economy-wide average. The progressivity of this two-tier pension system by the individual replacement rates relative to pre-retirement pay in the second set of charts. The flat-rate nature of the basic pension means that the total replacement rate declines sharply at first. The earnings-related pension, which pays a flat replacement rate up to a ceiling, offset this effect, until the threshold is reached. After this point, the decline in the replacement rate with pay accelerates again.

Figure 1, continued

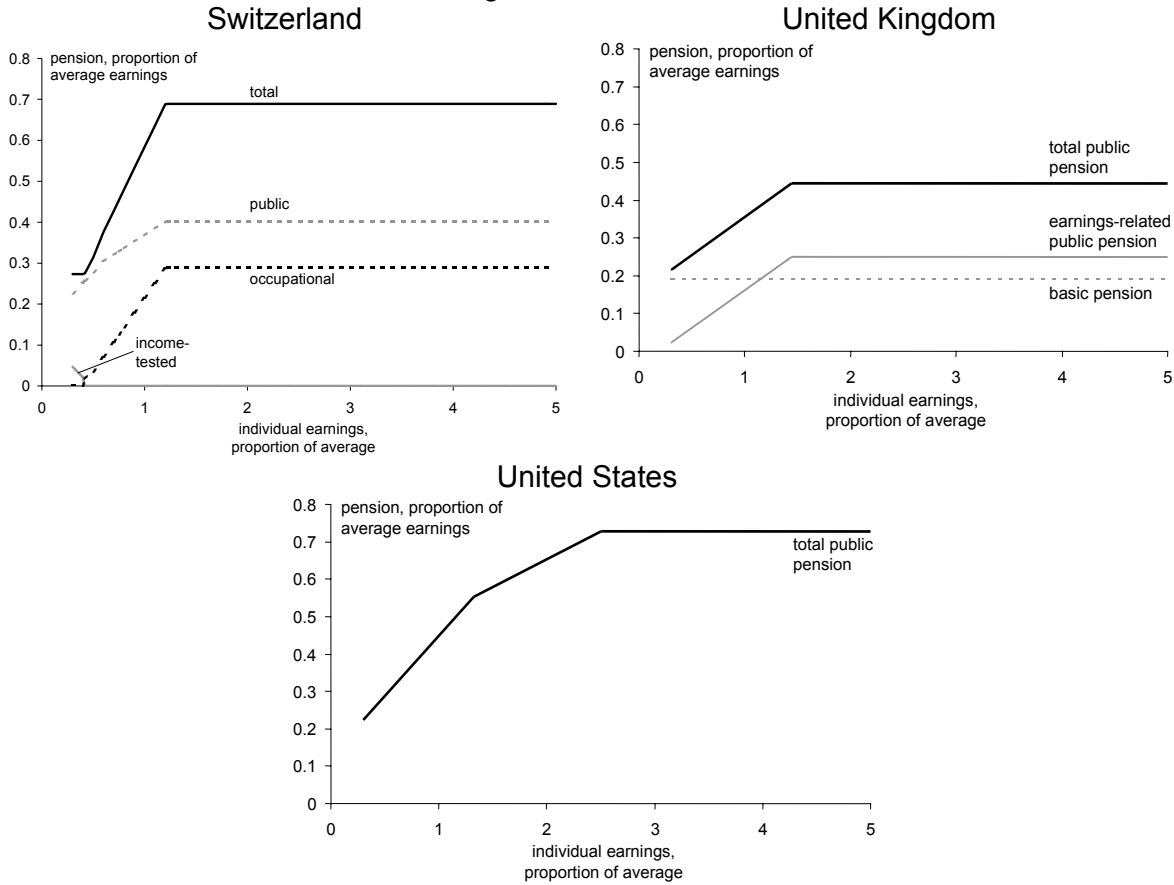




The picture for the **Netherlands** is relatively simple: the total pension is simply the basic scheme plus an earnings-related top-up. The integration of the basic and the earnings-related scheme means that the earnings-related pension nothing to the lowest-income workers. Unlike most of the 15 countries examined in this paper, there is no ceiling either to pension benefits or to pensionable pay under the quasi-mandatory occupational plans. Note that the model assumes that the individual remains in a single employer scheme throughout his or her working life. We will shortly return to the issue of pension portability.

The Dutch system overall is mildly progressive. Replacement rates are higher at low earnings because of the basic pension. At higher earnings, the basic and earnings-related pension replacement rates are the mirror image of one another, due to the integration procedure. So all workers with pay above half the economy-wide average receive a flat 70 per cent replacement rate.

Figure 1, continued



The mandatory pension scheme in **Sweden** has four different elements. The earnings-related and defined contribution pensions are proportional up to the contribution ceiling. Hence, the curves in the first chart begin as rays from the origin. The earnings-related pension is much larger than the defined contribution pension, because it receives contributions of 16 per cent, compared with 2.5 per cent paid into individual pension accounts. Working in the opposite direction, the model assumes that the rate of return credited to the notional accounts (earnings growth) is below the rate of return on investments in the funded defined contribution plan.

Low-income workers receive an income-tested benefit in retirement. This has two different withdrawal rates against income from the public earnings-related pension. This is apparent in the kink in the total pension curve at around half-average earnings. The analysis of the individual replacement rate confirms the strongly progressive role of this benefit. The funded defined contribution and earnings-related pension pay the same

replacement rate at earnings up to the ceiling, but the means-tested guarantee pension gives a substantial boost to low-income workers' retirement incomes.

At higher earnings levels, occupational pensions are the main source of income. The chart is based on the ITP scheme, which applies to white-collar workers. The ceiling for this scheme — 5.2 times average earnings — is a little off the horizontal scale. However, the switch from a 65-per-cent replacement rate to one of 32.5 per cent at 3.5 times average earnings is apparent in both charts.

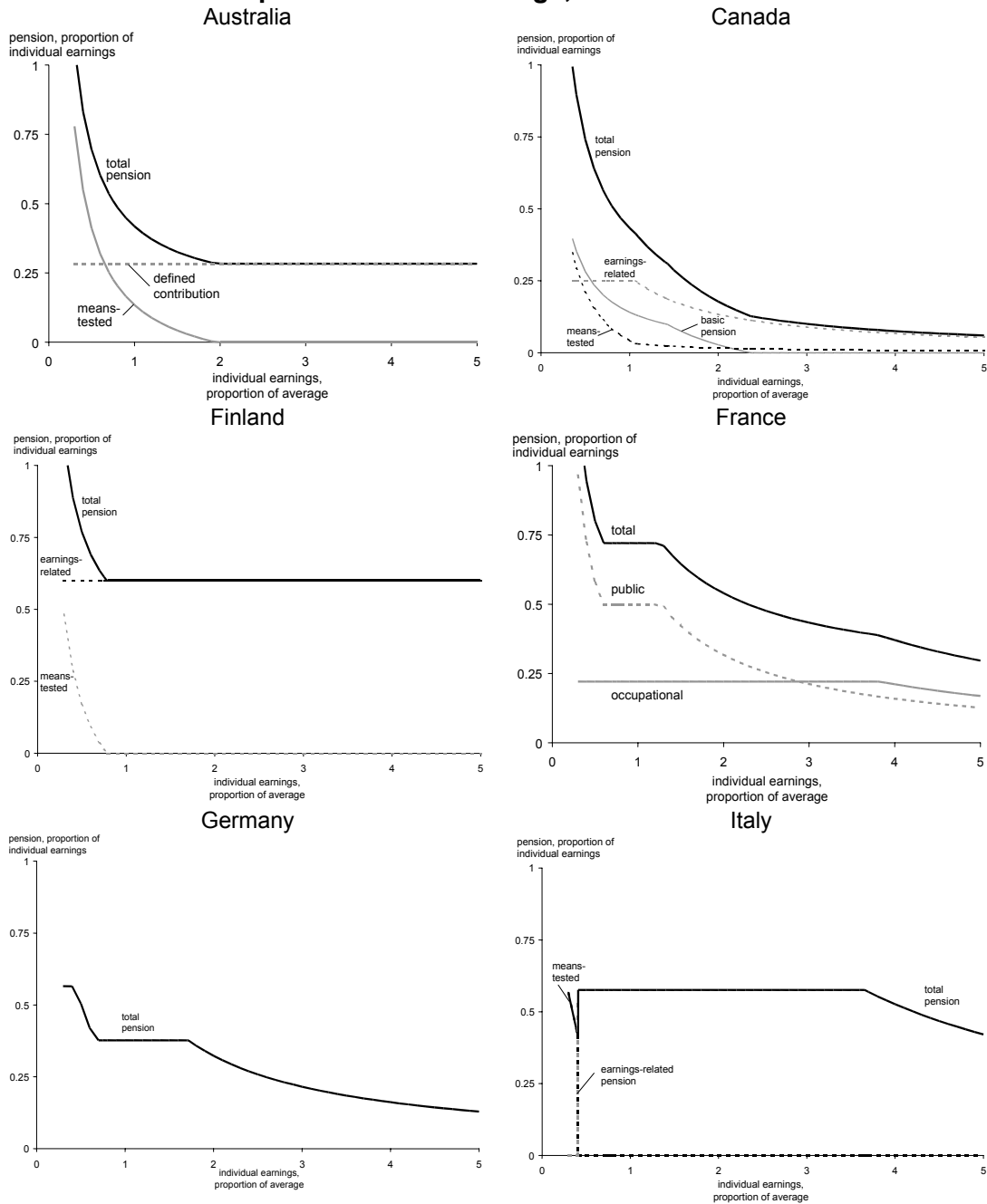
Means-tested benefits play a very important role in providing retirement incomes in the **United Kingdom**: 37 per cent of pensioner income units were entitled to means-tested support in 1997-98. However, a full-career worker earning 30 per cent of the economy-wide average would just fail to be entitled to the main means-tested benefit, known as income support. The basic pension pays a flat 20 per cent of economy-wide pay to workers of all income levels. The earnings-related pension pays 20 per cent of earnings above a floor. But there is quite a low ceiling to pensionable pay of 1½ times average earnings. Total benefits are therefore flat beyond this ceiling. The progressivity of this system is highlighted by the individual replacement rate in the second set of charts. The basic pension delivers quite high replacement rates to low earners, and the relatively low ceiling to pension benefits means that the earnings-related scheme is progressive across much of the earnings scale.

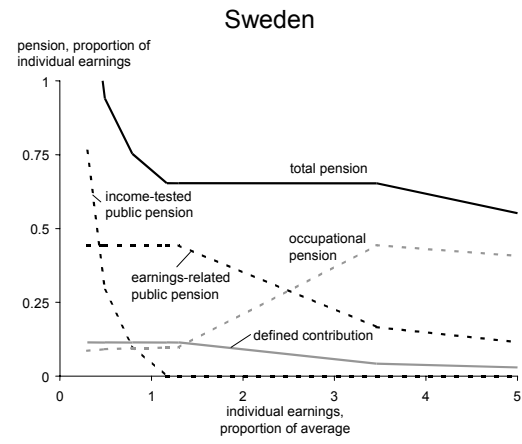
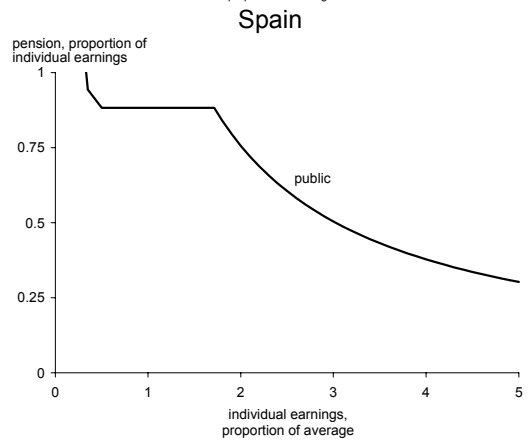
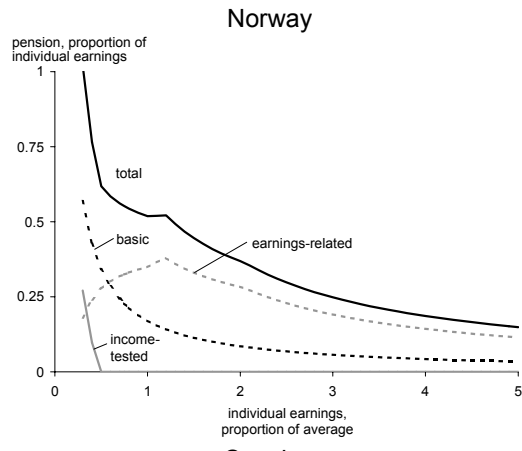
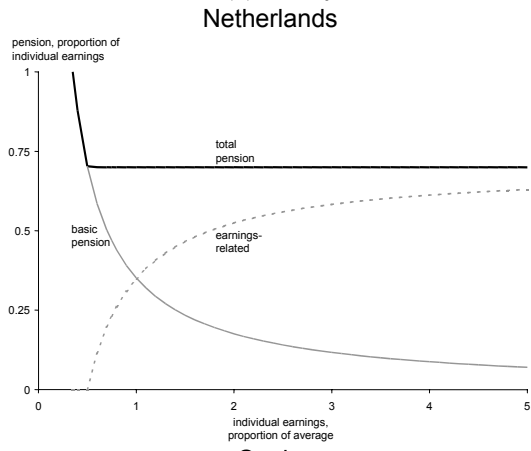
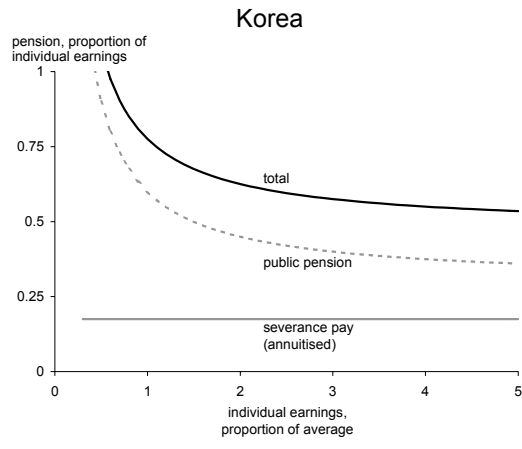
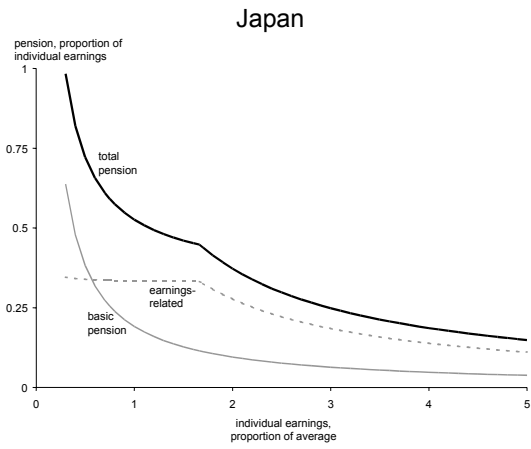
The public pension scheme in the **United States** is progressive because of the schedule of different replacement rates. The same effect is achieved by having a multi-tier public pension in most of the other countries analysed: Canada, Finland, Japan, the Netherlands, Sweden and the United Kingdom. Only Germany has a similar progressive formula for its public pension.

Although it is difficult to make out the 90 per cent rate applied to the lowest band of earnings (because it is close to the beginning of the curve), the shift from 32 to 15 per cent produces a clear kink. Maximum pensionable earnings are around 2½ times the economy-wide average. The result is a progressive benefit structure, with a monotonic decline in the individual replacement rate with earnings. The ceiling on pensionable pay, as elsewhere, also has an important effect. The social assistance benefit, supplemental security income, is set at a level lower than the public pension entitlement of a worker with a full career on 30 per cent of average earnings. However, some states' additions would be payable to lower-earners in these circumstances. California's supplement, for example,

would boost the total income of pensioners who had earned less than 50 per cent of average from around 20 per cent of economy-wide average earnings to nearly 29 per cent.

Figure 2. Mandatory pension benefits as a proportion of individual pre-retirement earnings, 15 countries





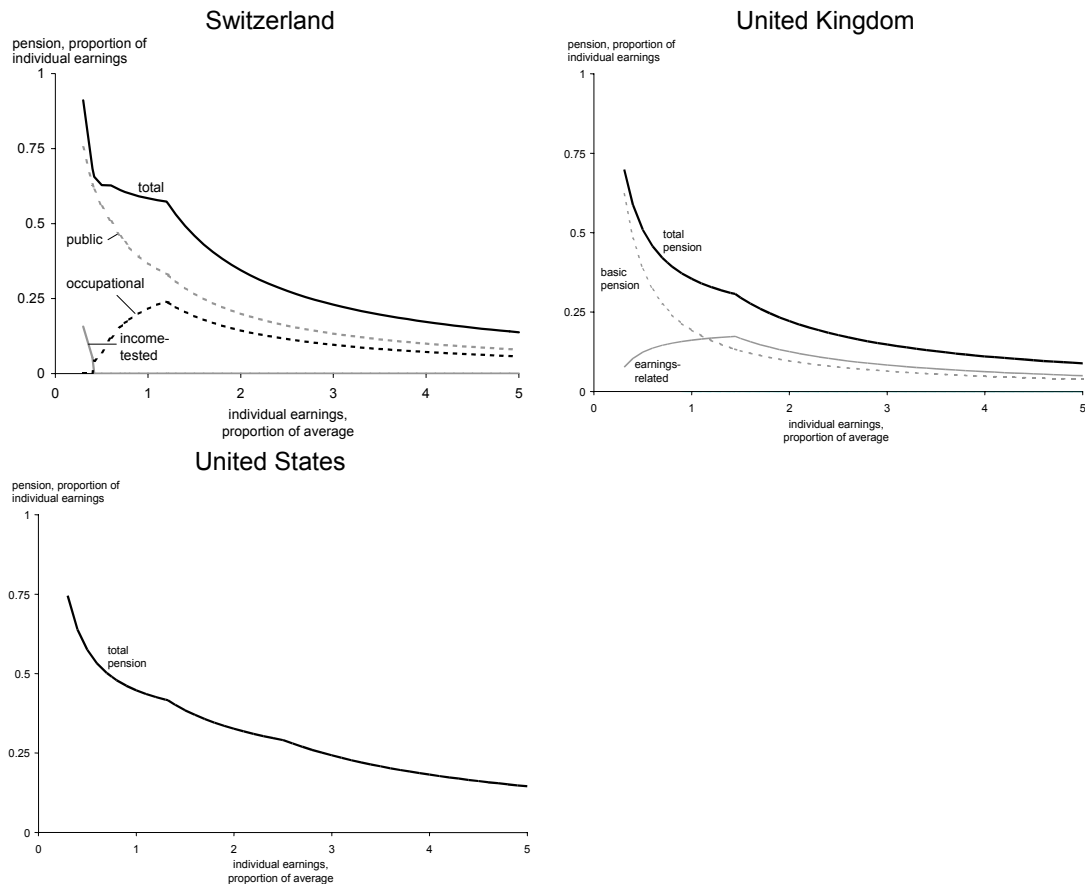


Table 8 compares the results from the charts of pension benefits (relative to economy-wide average earnings) at different levels of pay, given in Figure 1 above. The columns show different proportions of average earnings, ranging from one half to five times.

The paper has already discussed the patterns in each country in detail. However, it is worth now drawing out the different patterns between particular countries. They divide into two broad groups. The first — consisting of Canada, Germany, Japan, the United Kingdom and the United States — has ceilings to pensionable pay and/or to pension benefits in the mandatory system. The second group has either no ceiling — Finland and the Netherlands— or a very high ceiling — Sweden and Italy. At low levels of earnings, these countries pay broadly similar levels of benefits to the countries with relatively low pension maxima. But at high levels of earnings, benefits are constant in the first group, but continue to grow in the other four countries.

Table 8. Total mandatory pension benefits as a percentage of economy-wide average earnings by individual earnings level

	<i>Individual earnings, proportion of economy-wide average</i>						
	<i>0.5</i>	<i>0.75</i>	<i>1</i>	<i>1.5</i>	<i>2</i>	<i>2.5</i>	<i>5</i>
Australia	35	39	43	51	63	79	157
Canada	37	40	43	43	36	30	30
Finland	38	46	60	90	120	150	300
France	40	54	72	97	108	119	148
Germany	25	28	38	57	65	65	65
Italy	36	54	72	109	145	181	264
Japan	36	44	53	69	75	75	75
Netherlands	35	53	70	105	140	175	350
Norway	31	41	52	67	74	74	74
Spain	44	66	88	132	151	151	151
Sweden	47	57	69	98	131	163	276
Switzerland	31	45	58	69	69	69	69
United Kingdom	25	30	35	44	44	44	44
United States	29	37	45	58	65	73	73

These ceilings are therefore an important variable in explaining the structure of pension benefits in different countries. They probably deserve more prominence in the analysis of countries' retirement-income systems than they generally receive. Table 9 shows maximum pensionable earnings as a proportion of average pay. It also gives the maximum pension benefits that a full-career worker can earn. All countries have an earnings-related pension scheme of some sort, which means that the maximum pension benefit is generally earned by high-income workers. The exception is Canada, because of the claw-back of the basic pension from higher-income pensioners.

Table 9. Maximum pensionable earnings and maximum pension benefits, percentage of economy-wide average earnings

<i>per cent of average earnings</i>	<i>Maximum earnings</i>	<i>Maximum benefits</i>
Canada	107	44
Switzerland	120	69
United Kingdom	144	44
Japan	167	75
Germany	171	65
Spain	171	151
Norway	205	74
United States	250	73
Italy	365	264
France	382	148
Sweden	520	276
Australia	—	—
Finland	—	—
Korea	—	—
Netherlands	—	—

Note: maximum pensionable earnings in the Swedish public scheme are 130 per cent of average earnings and maximum pension benefits are 72 per cent of average earnings

Table 10 shows the pension as a replacement rate, relative to individual earnings. Table 8, in contrast, showed its level relative to economy-wide average earnings. Thus, Table 10 corresponds with Figure 2, whereas Table 8 corresponds with the results in Figure 1. This Table confirms the pattern of the previous analysis: particularly the distinction between countries with relatively low ceilings to pensionable pay and those with no maximum or a very high one. This, as discussed in more detail below, reflects a fundamental difference in philosophy between different countries' mandatory pension regimes. Countries with high ceilings provide comprehensive retirement-income insurance through the mandatory system. They aim to give all workers, including those with high incomes, a retirement income that is a high proportion of pre-retirement earnings. At the other end of the spectrum are countries such as Canada and the United Kingdom. Although both have an earnings-related scheme, these are on a much smaller scale. Thus, their mandatory regimes are focused more on redistribution: ensuring that all pensioners meet a reasonable minimum income standard. This had led to the development of voluntary private provision to perform the insurance role for higher-income workers.

Table 10. Total mandatory pension benefits as a percentage of individual earnings by individual earnings level

	<i>Individual earnings, proportion of economy-wide average</i>						
	<i>0.5</i>	<i>0.75</i>	<i>1</i>	<i>1.5</i>	<i>2</i>	<i>2.5</i>	<i>5</i>
Australia	71	53	43	34	31	31	31
Canada	74	54	43	29	18	12	6
Germany	50	38	38	38	32	26	13
Finland	77	61	60	60	60	60	60
France	80	72	72	65	54	48	30
Italy	58	58	58	58	58	58	42
Japan	72	59	53	46	38	30	15
Korea	108	88	78	68	63	60	54
Netherlands	70	70	70	70	70	70	70
Norway	62	55	52	45	37	30	15
Spain	88	88	88	88	76	61	30
Sweden	93	77	69	66	65	65	55
Switzerland	63	61	58	46	34	28	14
United Kingdom	51	41	35	30	22	18	9
United States	57	49	45	39	33	29	15

3. Empirical results: net pension benefits

Personal income taxes and social security contributions have an important impact on the living standards of older people relative to those of the population as a whole. This section calculates net replacement rates: that is, pension benefits less any income tax and social security contributions due relative to net earnings (again, after income tax and social security contributions).

The details of the calculations of tax liabilities and net incomes for illustrative people in work are set out in the OECD's *Taxing Wages* report (OECD, 2001). The pensioner tax calculations are described in a companion paper to this one: Keenay and Whitehouse (2002a).

The overall effective tax rate on people during retirement is usually lower than when they were working for three main reasons. First, tax systems are progressive and over most of the income range, the gross replacement rate is less than 100 per cent. Secondly, social security contributions are typically levied only on earnings and not on pension benefits. Where pensioners are liable for social security contributions, these are usually levied at a lower rate than on people of working age. Finally, many countries have additional concessions to pensioners in their personal income tax.

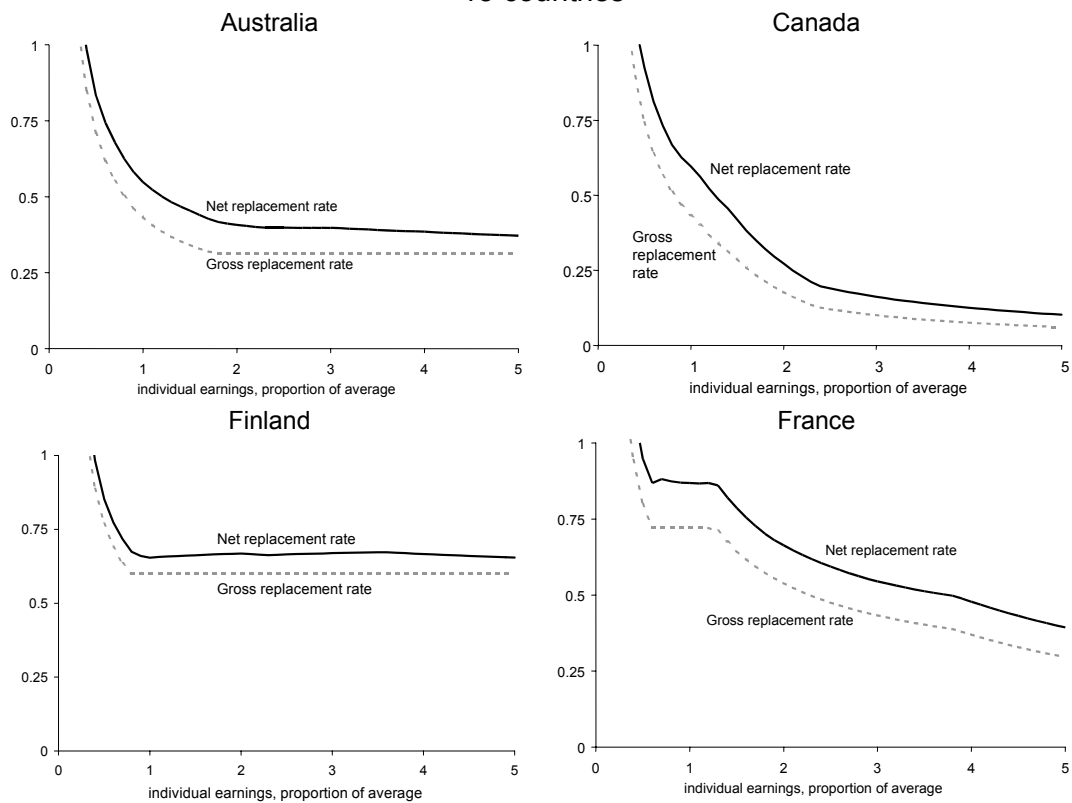
These last two effects are isolated in the companion papers (Keenay and Whitehouse, 2002a,b,c), which look at the average effective tax rate paid by workers and pensioners at the same income level. These can be up to 30 percentage points lower for older people than they are for people of working age. The overall impact of the tax system — including the effect of the general progressivity of the income tax — can be seen by comparing gross and net replacement rates at different levels of income.

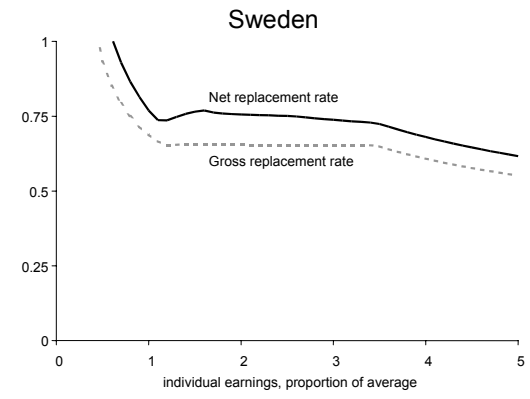
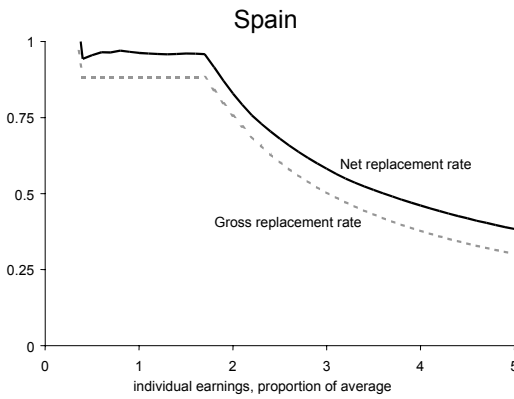
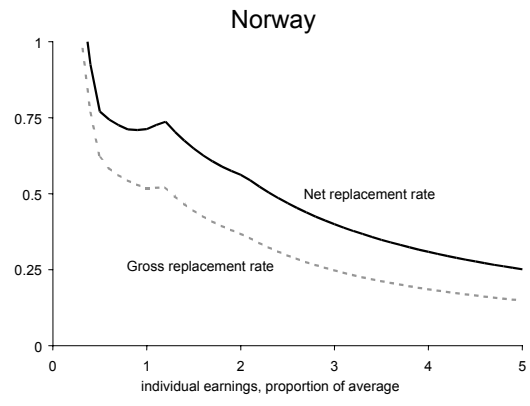
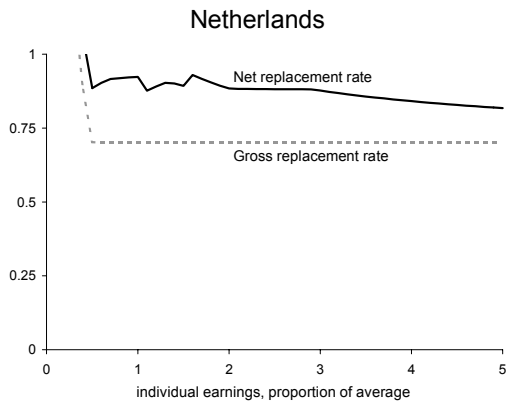
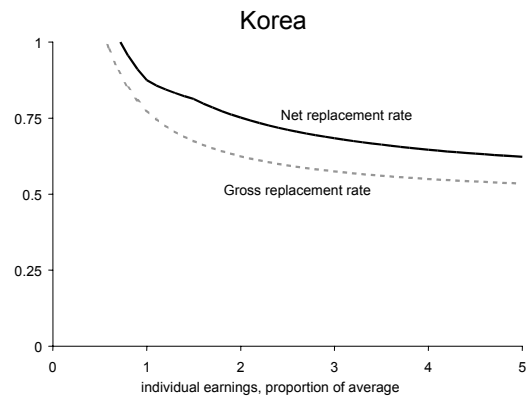
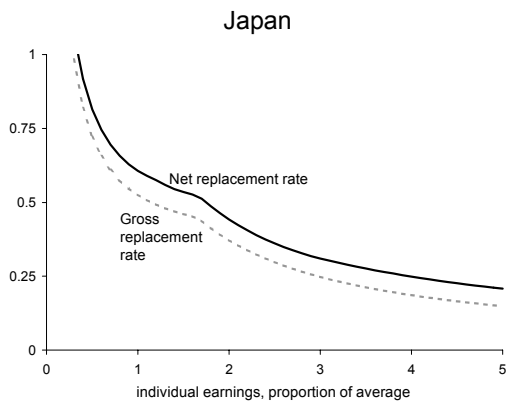
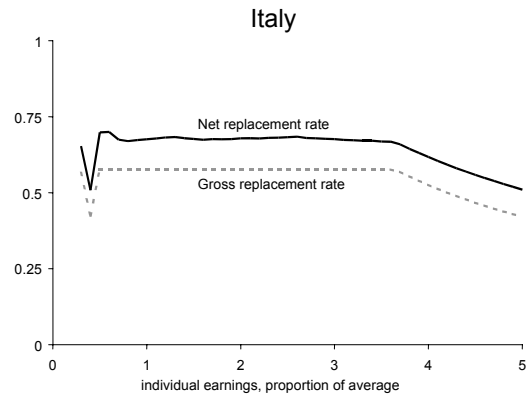
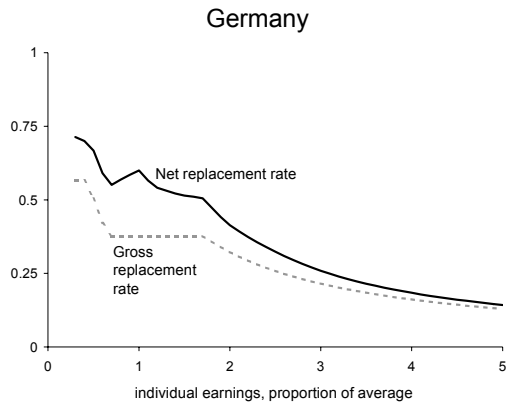
Figure 3 shows gross and net replacement rates for the 15 countries. Again, the charts show these measures for earnings between 0.3 and five times the economy-wide average, capped at 100 per cent. The gross replacement rate is simply the total pension line from Figure 2. The net replacement rate compares net pension with net earnings.

At the earnings of the average production worker, the net replacement rate is 13 percentage points higher than the gross, averaging across the 15 countries. Outliers are the Netherlands, where the difference is 22 points, and Canada and the United States (16 points). At the other end of the spectrum, the difference between net and gross levels in Finland (six points), Sweden and Japan (both eight points) are particularly small. The explanation for the differences between countries is complex. For example, the absolute

difference in the Netherlands is large across most of the income range because the Dutch quasi-mandatory occupational pensions pay the highest replacement rate among the 15 countries. In Canada and the United States, the large difference reflects the value of additional tax concessions given to older people. The small differences in Finland and Sweden are because tax concessions are withdrawn from middle- and higher-income pensioners. In Japan, both workers and pensioners face a very low direct tax burden by the standards of other OECD countries.

Figure 3. Gross and net replacement rates
Mandatory pension benefits as a proportion of individual pre-retirement earnings before and after income tax and social security contributions, 15 countries





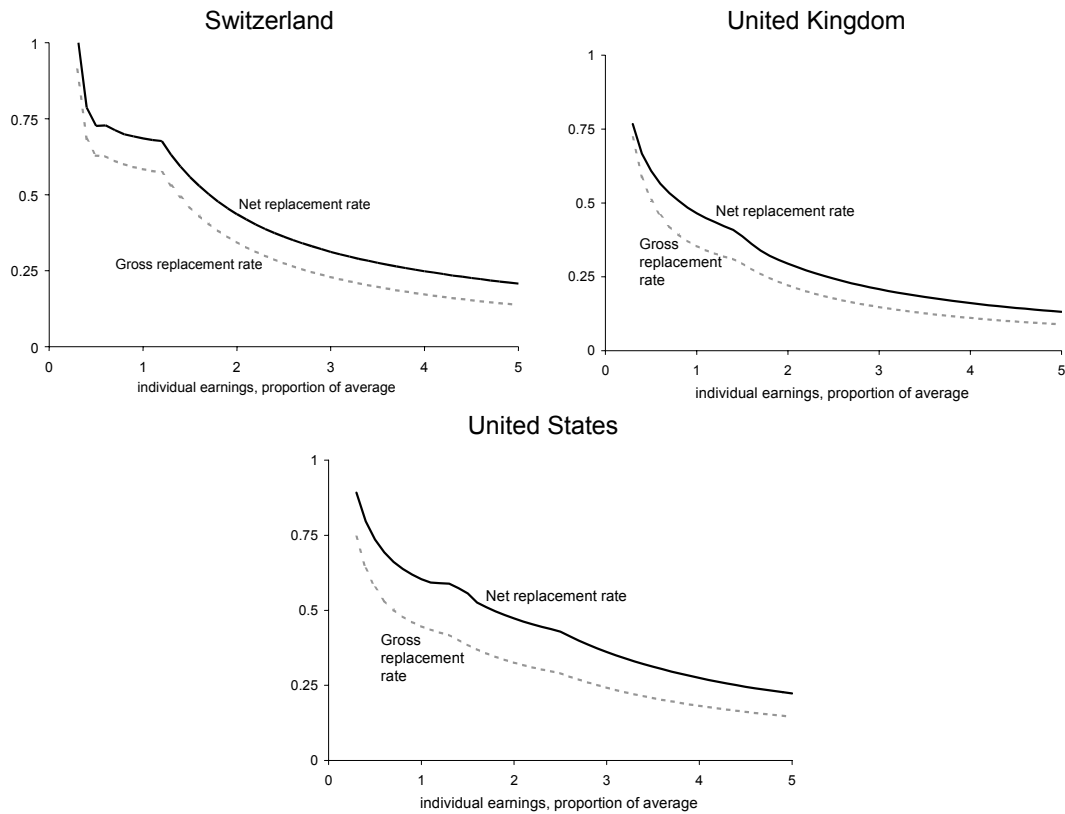
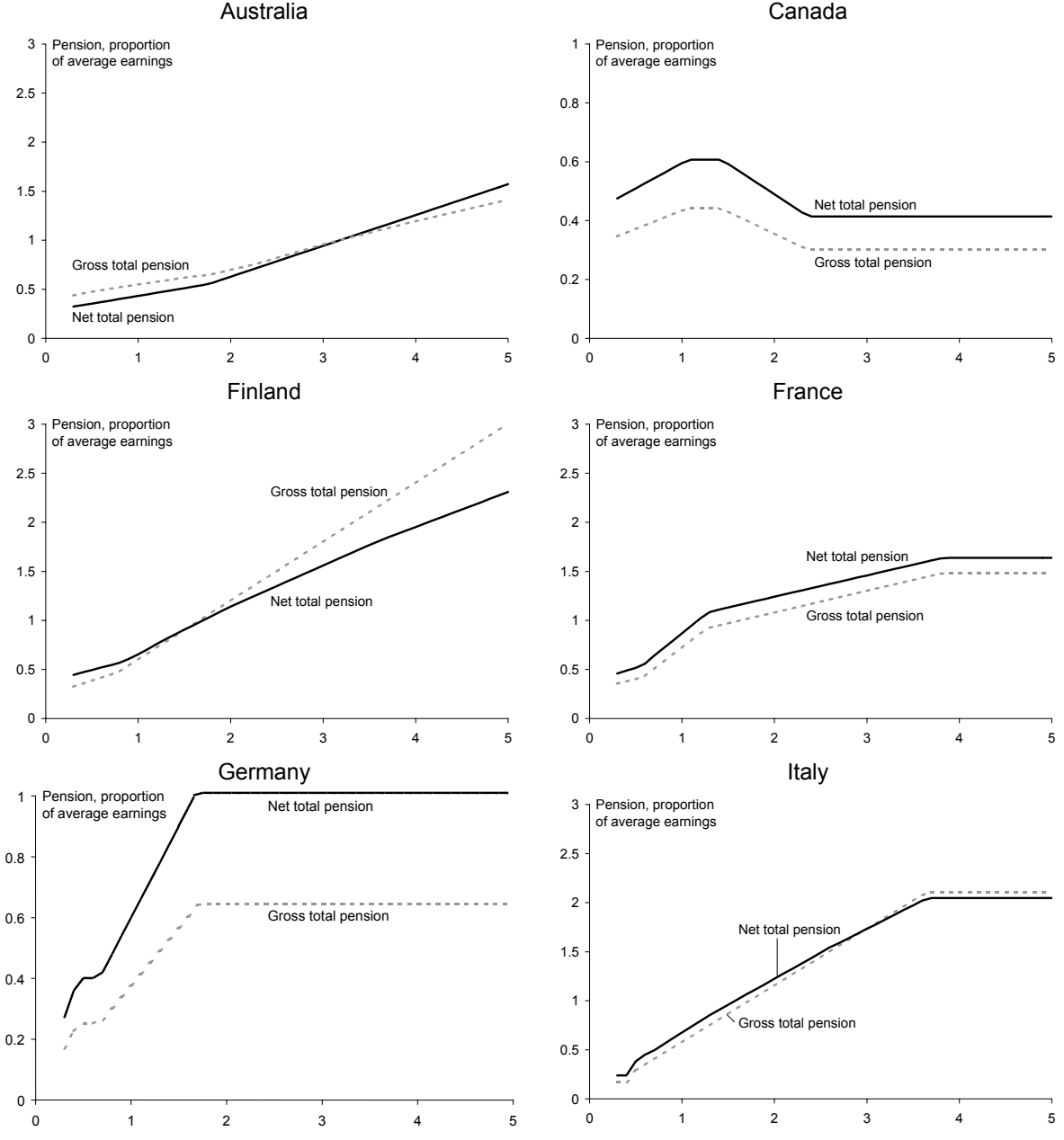
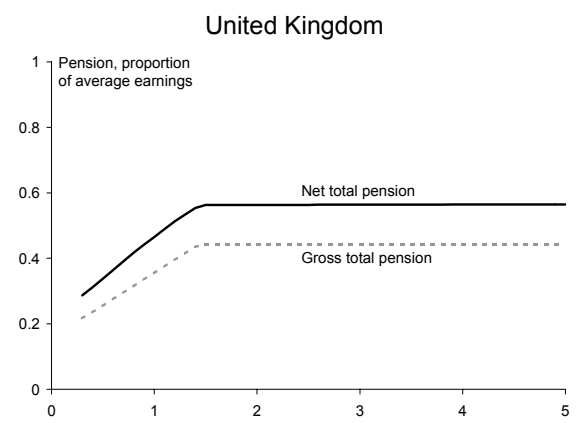
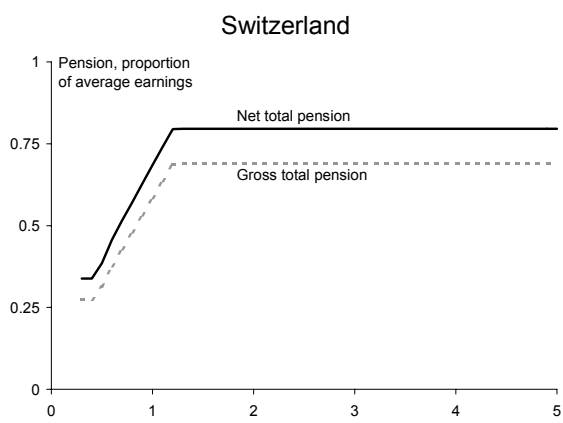
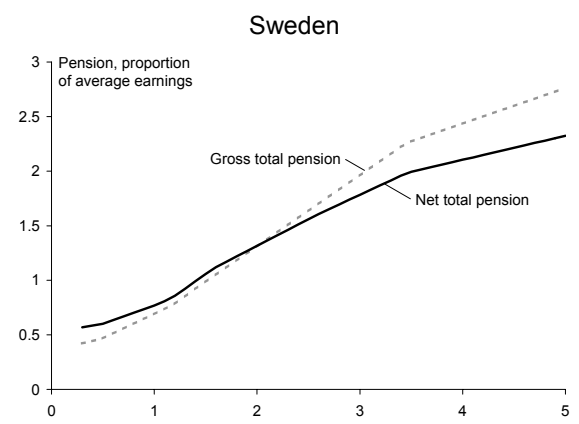
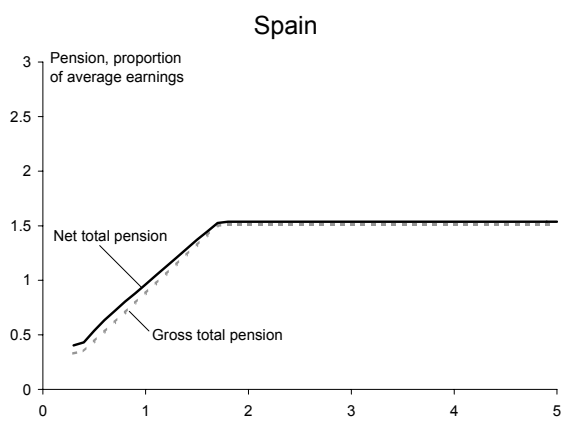
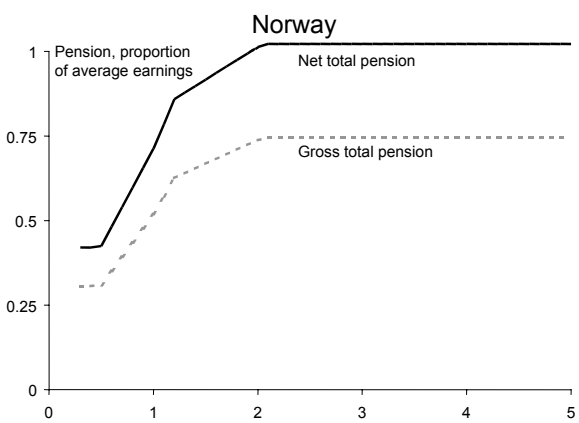
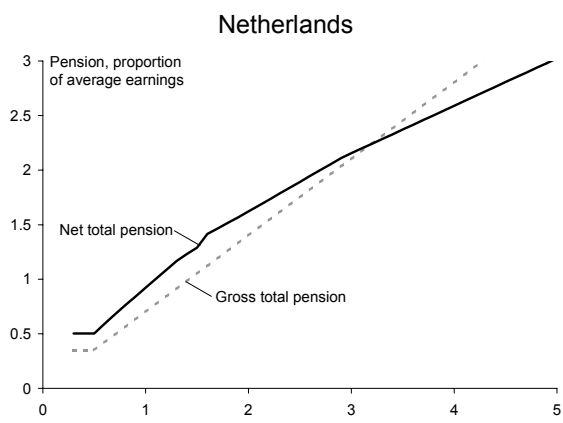
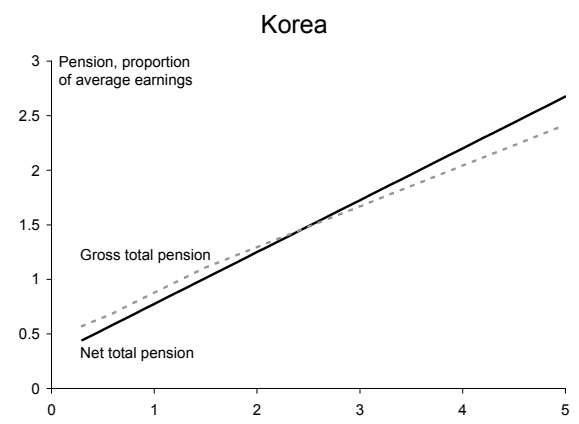
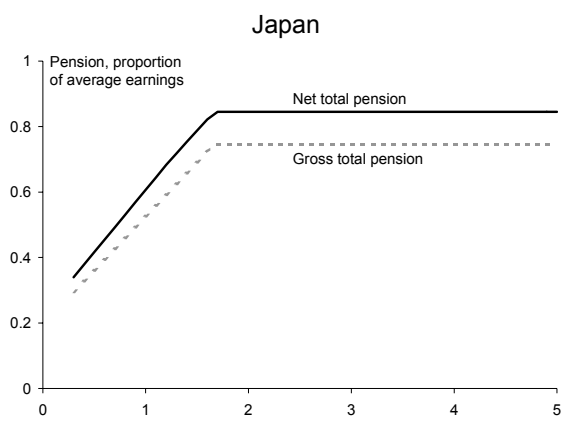
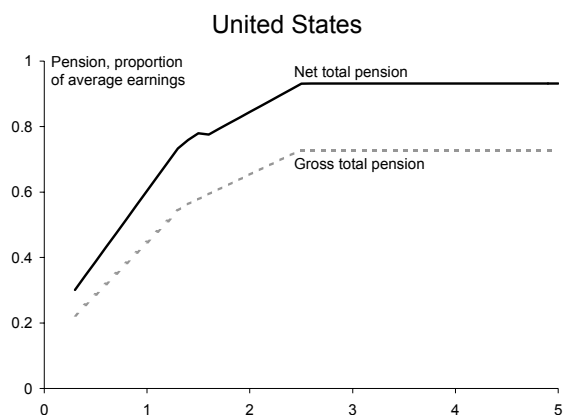


Figure 4 shows gross and net pensions as a proportion of economy-wide average earnings. This chart corresponds to the gross results in Figure 1 (while Figure 3 is the analogue of Figure 2). Again, the charts cover the earnings range from 0.3 to five times the average. The charts for countries without ceilings to pension benefits (or a very high ceiling) are capped at three times average earnings. In Figure 3, net replacement rates were higher than gross replacement rates for the three reasons set out above. In Figure 4, the grey, dotted lines (the same as the total pension data in Figure 1) show the ratio of gross pension entitlement to economy-wide gross average earnings. The black, solid line shows the net pension entitlement divided economy-wide net average earnings. In the countries without ceilings or with high ceilings to pensionable pay, the net pension can fall below the gross pension as a proportion of economy-wide average earnings. This is because the average effective tax rate on higher-income pensioners can exceed that paid by the average production worker.

Figure 4. Gross and net pension values by earnings
Mandatory pension benefits as a proportion of economy-wide earnings before
and after income tax and social security contributions, 15 countries







4. Voluntary private pensions

Voluntary occupational pension schemes are discussed separately from public and statutory quasi-mandatory private schemes because of the complex issues they raise.

In the absence of detailed data on the benefit formulae of occupational schemes in Germany and Japan, this section focuses on Canada, the United Kingdom and the United States. As Tables 11 and 12 show, the proportion of the elderly with income from employer-provided pensions is much higher in the three Anglo-Saxon countries than in Germany or Japan, even though coverage of the workforce is similar. (The small proportion in Japan receiving an occupational pension income is probably explained by the fact that most schemes pay out a lump sum rather than an income stream. In Germany, the explanation is most likely to be the long vesting periods in occupational plans, which mean that many people leave covered jobs before establishing a pension entitlement.)

Table 11. Percentage of pensioners with income from employer-provided pensions and percentage of workers covered by occupational pension plans, late 1990s

<i>per cent</i>	<i>Percentage of pensioners with occupational pension income</i>			<i>Percentage of workers covered by occupational pension plans</i>		
	<i>All</i>	<i>Men</i>	<i>Women</i>	<i>All</i>	<i>Men</i>	<i>Women</i>
Canada	41	54	31	45	52	36
Germany	—	21	9	45	—	—
Japan	10	—	—	47	—	—
Netherlands	50	76	23	90	—	—
United Kingdom	49	66	32	47	58	41
United States	36	48	26	44	48	38

Source: Johnson (1998), Table 3.1; United Kingdom *General Household Survey* data; United States Department of Labor (1999)

In contrast, occupational pension schemes in Australia and Finland are statutory. In the Netherlands and Sweden, they achieve near universal coverage through industrial-relations agreements at the industry and national level respectively. Occupational schemes in these countries were discussed along with mandatory public pension schemes above. Table 12 gives data on the proportion of workers covered by occupational plans for some more of the countries surveyed here.³⁸

Table 12. Percentage of workers covered by occupational pension plans

	<i>Percentage of workers</i>
Australia	91
Canada	33
Finland	100/15
Germany	46
Italy	5
Japan	50
Netherlands	91
Norway	50
Sweden	90
United Kingdom	46
United States	45

Note: statutory plans achieve 100 per cent coverage in Finland; the 15 per cent figure relates to additional, voluntary provision by employers

Source: OECD (2001), Table 6.2; Bateman, Kingston and Piggott (2001); Antolin and Suyker (2001)

³⁸ The data are broadly comparable between the two sources, except for occupational pension coverage in Canada. It has not been possible to determine the reason for the difference.

4.1 *Modelling occupational pension values*

One difficulty in modelling voluntary occupational schemes is that their terms and conditions differ. Indeed, there are no comprehensive data for Germany and Japan on the rules of occupational schemes. However, in Canada, the United Kingdom and the United States, there are regular, detailed surveys of the benefit formula occupational plans.

Table 13 shows the parameters chosen for the modelling. These are, where possible, ‘typical’ and the approximate proportion of members covered by particular provisions are shown in parentheses where available. More detailed analysis of these parameters is provided in the relevant country chapter.

Table 13. Features of model defined benefit occupational pensions in Canada, the United Kingdom and the United States

	<i>Canada</i>	<i>United Kingdom</i>	<i>United States</i>
Earnings measure	Final salary (70%)	Final salary (95%)	Final salary (55%)
Vesting	5 years’ service	2 years’ service	5 years’ service
Pension age	65	65	65 (47%)
Accrual rate	2% a year (70%)	1.25% a year (65%)	1.5% a year
Integration method	1.3% accrual up to public benefit ceiling	Deduct value of basic state pension (12%)	Lower accrual rate on earnings covered by public benefit
Pre-retirement indexation	None	Price inflation	None
Post-retirement indexation	Half price inflation	Price inflation	None

Occupational pensions differ from public-sector schemes in that the benefit formula depends on some measure of ‘final’ earnings rather than average pay. The latter is more common in public programmes (at least in OECD countries: Disney and Whitehouse, 1999, Tables 1 and 2). Moreover, public-sector plans with final-salary formulae are based on pre-retirement pay, while occupational pension benefits are based on the final salary in a particular scheme. So the benefits of someone leaving a plan at age 40 — known as an ‘early leaver’ — are based on earnings at that age, not pay immediately before retirement. This, as the following sections show, has important implications for the value of pension benefits.

4.2 *United Kingdom*

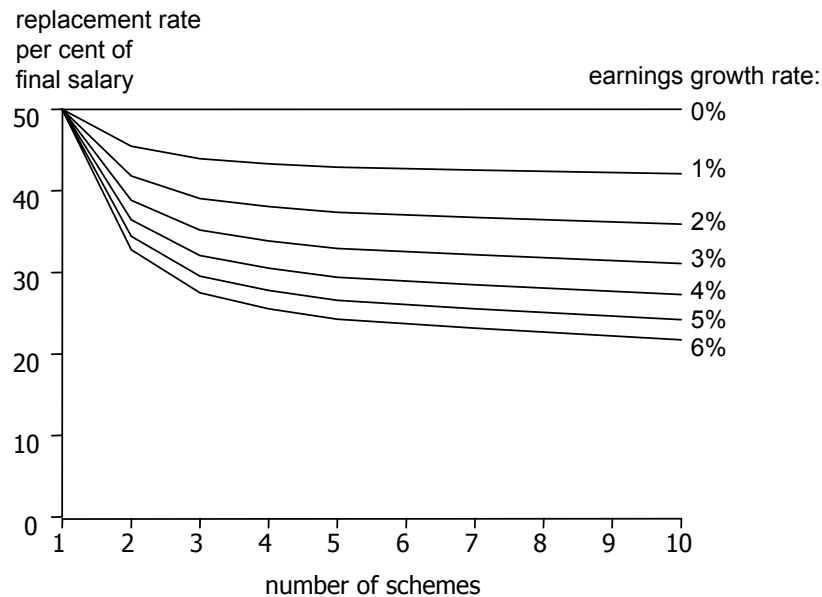
A series of regulatory changes since the mid-1970s have improved the protection of pension rights of early leavers. Since 1990, pension rights that are ‘preserved’ in a scheme when an employee moves must be uprated in line with inflation up to a ceiling of 5 per cent. (A preserved pension is when employees retain their rights to an annuity in their former employer’s scheme, as opposed to a transfer, when the present value of the pension is moved to a new occupational or personal plan. Return of pension contributions as a lump sum was common until this practice was forbidden in the 1970s.)

If a worker were to spend a full 40-year career in the model scheme, he or she would receive a pension of one half ($\frac{40}{80}$ ths) of final, pre-retirement salary. People who spend 20 years in two schemes would get a quarter of final salary from the second scheme plus a quarter of their salary in the last year of the first job from the first scheme. The relevant measure of earnings for the first scheme is their real salary, because this must now be uprated in line with price inflation (to the five-per-cent ceiling) to retirement. So if people’s real earnings continue to grow in their second job, then the pension from their first scheme will be less than a quarter of ‘final’ salary, *i.e.*, their pay immediately before retirement. The degree of loss depends on how fast individual earnings grow.

Figure 5 illustrates this effect for a range of different earnings-growth assumptions and for a series of equal-length tenures in different plans. If their real earnings were to grow at one per cent, the pension replacement rate falls from one half of final salary for people who joined one scheme to 45 per cent for people who spent equal time in two plans. The replacement rate falls with faster increases in earnings: to less than 40 per cent with three per cent earnings growth and just one third with six per cent earnings growth.

Working across the figure, the more schemes the individual joins, the lower the replacement rate at any positive rate of earnings growth. For example, if someone spent eight years each in five different plans, the replacement rate falls to under a third with three-per-cent earnings growth and to less than a quarter with six-per-cent earnings increases.

Figure 5. Pension replacement rate as a percentage of final salary by number of schemes joined and rate of individual earnings growth, United Kingdom



The analysis in Figure 5 raises two questions. First, how often do people move between jobs and different pension plans? Secondly, how fast do individual earnings grow over the working life?

The United Kingdom government’s view on the first question is that an increasingly flexible labour market has led to a more mobile workforce which ‘render[s] the traditional occupational pension structure obsolescent or inappropriate for major sections of the workforce’.³⁹ The National Association of Pension Funds (a club for mainly large, mainly defined benefit occupational schemes) has attacked this view vociferously. The association describes the government’s position as ‘based on flawed analysis and interpretation of the scale and nature of changes in employment patterns during the last two decades’.⁴⁰ Average job tenure, according to the association’s study (Meadows, 1999), has changed little over the past 20 years: down to five years six months from six years one month in 1975. ‘The idea that in the past many people had a “job for life” with a single employer is a myth’, the association said. This result is confirmed by the Department of Social Security’s Retirement Survey, which collected full labour-market histories from

³⁹ Department of Social Security (1998a).

⁴⁰ National Association of Pension Funds (1999); see also Timmins (1999b).

people aged 55-69 in 1988-89. These showed that men had eight jobs on average over their working life, lasting an average of seven years one month. Women had slightly over five jobs lasting an average of five years two months.⁴¹

Cross-section studies (for example, Disney and Whitehouse, 1991) of age-earnings profiles generally show an inverted-U shape, with real earnings falling at older ages. The pattern varies with occupation. The pay of professional, and to a lesser extent, managerial workers rises steeply with age initially. Professional earnings flatten when workers reach their mid-50s, with an earlier peak for managers. In contrast, the profiles for manual workers are much flatter and peak earlier, in the early to mid-40s. The decline in earnings after their peak is also relatively larger, so that workers from their late 50s onwards earn the same or less than workers in their 20s. However, cross-section analysis conflates age and cohort effects. For example, the pay of 50-year-olds today might tell us something about the pay of today's 40-year-olds when they are 50. But these cohorts will differ in many important attributes that will affect pay: education, training, labour-market experience *etc.* Following the same cohort over time, other studies have found that age-earnings are broadly linear, with pay continuing to rise even at older ages.⁴² These studies suggest a 2-2½ per cent annual increase for manual workers and five per cent for professionals over the working life.

Putting these analyses together suggests a high cost to most workers from lack of portability of occupational pension benefits. Average tenure of five-to-six years suggests that people would join seven or eight schemes with a career fully covered by occupational plans. Professional workers might expect a replacement rate of around a third and manual workers around 45 per cent with that rate of job change. If the pattern of job tenure is broadly similar today as it was 20 years ago, then occupational pensions, which reward those with 'a job for life', have never been appropriate for the majority of the workforce.

This result is borne out by the low level of occupational pensions in payment compared with earnings. The average occupational pension in 1997-98 (among the 60 per cent of pensioners with some income from this source) was 27 per cent of economy-wide average earnings.⁴³ Unfortunately, we do not yet have panel data of sufficient length to analyse individual replacement rates. But this statistic gives a broad indication of average replacement rates. Its low level is indicative in part of the fact that few people spend their

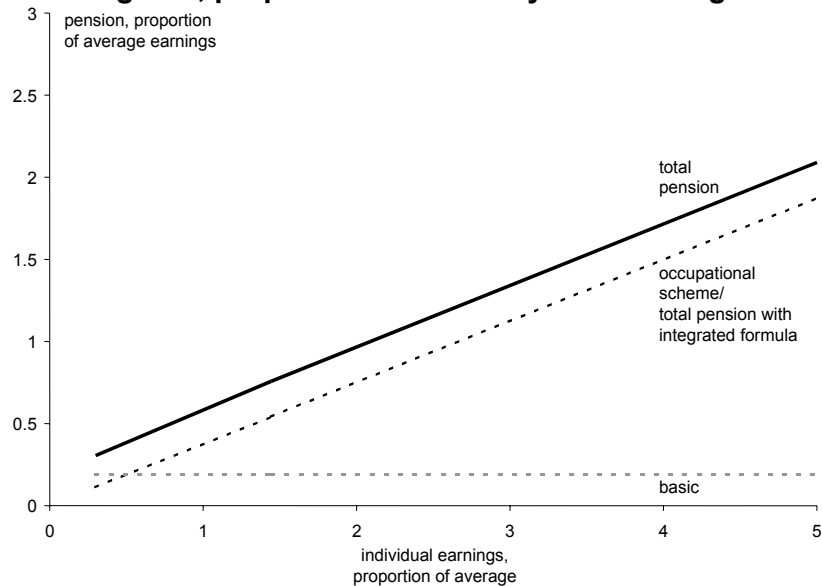
⁴¹ See Disney, Meghir and Whitehouse (1994) and Johnson, Disney and Stears (1996). The retirement survey is described in Bone *et al.* (1992).

⁴² See, for example, Meghir and Whitehouse (1996) and Gosling, Machin and Meghir (1998).

whole working lives covered by occupational schemes and in part of the cost of lack of portability.

Figure 6 shows how occupational pensions affect total pension benefits (compare Figure 1). The occupational pension scheme member foregoes his or her entitlement to the public earnings-related pension, Serps, but is still entitled to the basic pension. The value of the occupational pension is proportional: the curve is a ray through the origin. This curve is also the value of the total pension in the model, integrated scheme, which deducts the value of the basic pension from the total benefit.⁴⁴ Note that the modelling assumes that the individual spends eight years each in five different occupational pension schemes. Membership of fewer schemes across the career would result in a higher benefit, as Figure 5 illustrates.

Figure 6. Value of public and private pension benefits in the United Kingdom, proportion of economy-wide average earnings



The ceiling on pensionable earnings for occupational benefits, set in the United Kingdom's tax law, was £90,600 in 1998-99. This limit is equivalent to 5.2 times economy-wide average earnings. This is off the scale. So, including occupational pensions, the

⁴³ Department of Social Security (2000), Table 12 shows mean receipt of £92 a week.

⁴⁴ Some schemes deduct the lower earnings limit for social security contributions, but this, by law, is broadly equivalent to the basic pension.

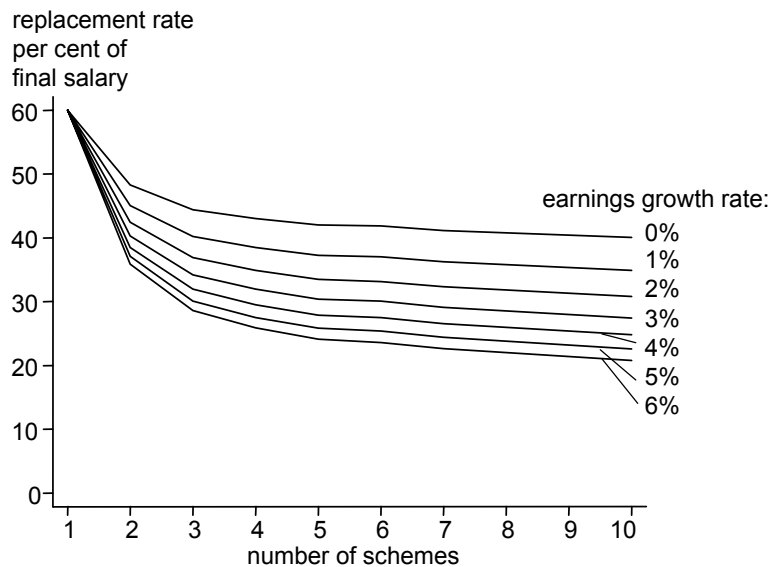
pattern of benefit receipt by earnings is similar to other countries with uncapped earnings-related pensions: the Finland and the Netherlands. Indeed, the protection for early leavers in the Dutch scheme has many similarities with the United Kingdom's system. However, broad, industry-wide coverage of the Netherlands' schemes means that the issue of pension transfers is probably less significant.

4.3 *United States*

While the United Kingdom has introduced protection for price inflation in its occupational pension system both before and after retirement, regulatory attention in the United States has focused on the solvency of occupational pension schemes and on vesting rights. Pension benefits are almost entirely unindexed, both after retirement and, for early leavers, between the point of leaving a job and the point of retirement. Early leavers' pensions are, as a result, much lower relative to their level in the United Kingdom.

This is illustrated for a model occupational scheme in the United States in Figure 7. As in Figure 5, it shows the occupational pension replacement rate for individuals joining a different number of occupational schemes of equal tenure throughout their working life. (Note that the observations for people joining ten schemes with four years' tenure each are for illustration only: since most schemes have a five year vesting rule, such people would receive no occupational pension benefit.)

Figure 7. Pension replacement rate as a percentage of final salary by number of schemes joined and rate of individual earnings growth, United States

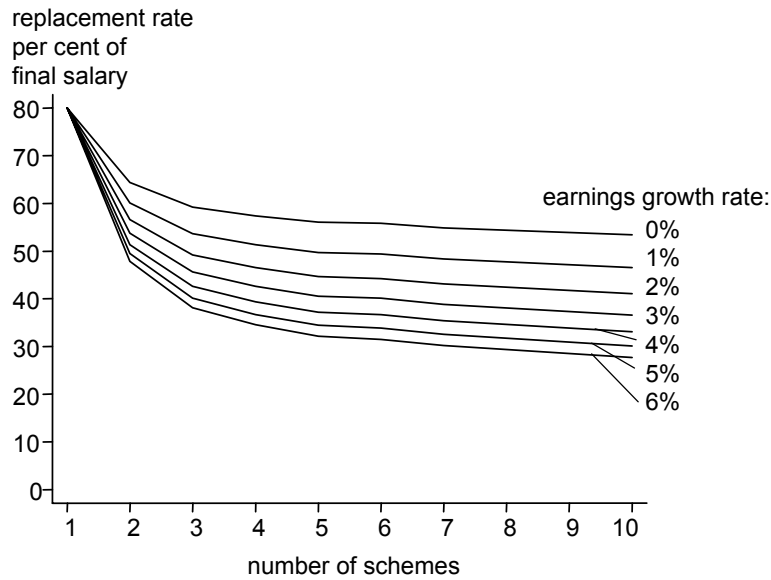


The greater cost of moving jobs can be seen clearly by comparing Figures 5 and 7. In the United States model scheme, a full career in an occupational scheme would give a replacement rate of 60 per cent. But joining two schemes for 20 years each would cut this replacement rate to 45 per cent, five schemes for eight years each to just 37 per cent. This assumes inflation of 2.5 per cent a year: an episode of higher inflation would erode the value of preserved or deferred occupational pension rights more rapidly. This assumes individual real earnings grow at just 1 per cent a year. With 3 per cent real earnings growth, these figures are 40 per cent and 30 per cent respectively.

4.4 Canada

Canadian occupational schemes are similarly vulnerable to inflation between the point of leaving a particular plan and the time of retirement. Figure 8 shows the results for the model scheme in Canada. The pattern is the same as in the United States (Figure 7), but accrual rates, and so replacement rates, are typically higher in Canada.

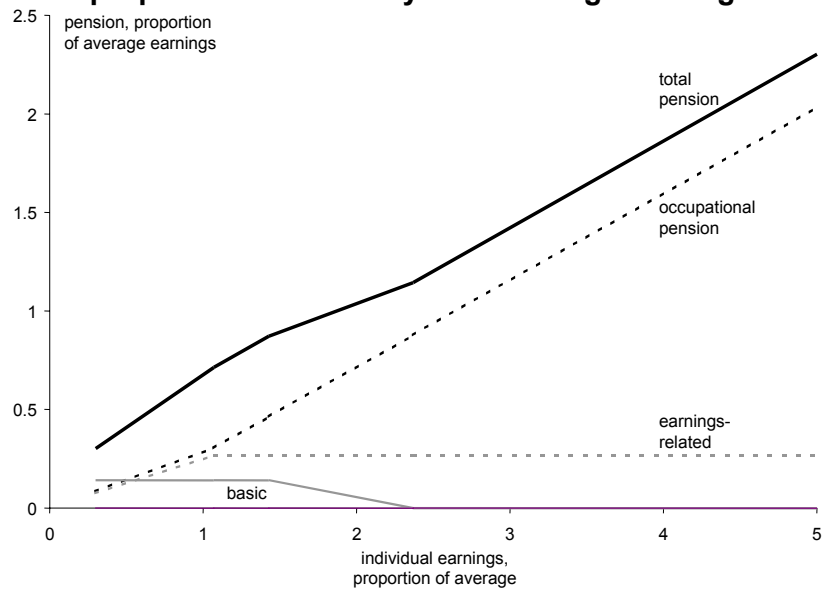
Figure 8. Pension replacement rate as a percentage of final salary by number of schemes joined and rate of individual earnings growth, Canada



Integration of occupational pension benefits is rare in the United Kingdom, but very common in both Canada and the United States. Integration practice in the United States varies substantially, so it is difficult to devise a reasonable ‘model’ procedure. In Canada, in contrast, the practice of applying a lower, 1.3 per cent accrual rate to earnings below the ceiling for the public, earnings-related benefit is widespread.

Figure 9 shows the results of modelling such a scheme. Even at the lowest earnings levels, the retirement income of occupational-scheme members is sufficient to float them off the means-tested supplement. The kink in the schedule for the occupational pension value at the ceiling of the earnings-related pension is readily apparent: here the pension accrual rate shifts from 1.3 to two per cent of earnings. As in the United Kingdom, the pattern of total pension entitlement, once occupational schemes are taken into account, is much closer to Finland and the Netherlands.

Figure 9. **Value of public and private pension benefits in Canada, proportion of economy-wide average earnings**



5. Pensions for different family types and additional analyses

To simplify the analysis, the calculations in the previous three sections have shown the pension benefits for single people with a full career in employment retiring at the standard pensionable age. This section describes how systems treat married couples, people with gaps in their work histories and the self-employed. Ongoing work by the OECD's Economics Department and the Directorate for Education, Employment, Labour and Social Affairs is looking at pension benefits for people retiring at different ages. Preliminary results from this work were presented in OECD (2001), Annex 2.

5.1 *Married couples*

The pension systems surveyed in this report adopt a number of different approaches to benefits for married couples relative to those for single people. Most earnings-related schemes use the individual as the unit of assessment: the same benefit formula applies to single people and couples alike. The one exception to this among the 15 countries is the United States, where social security pays a 50-per-cent dependants' supplement in respect of spouses with no entitlement of their own (or only a small one).

The United Kingdom pays a 60-per-cent dependant's supplement in its basic pension system again to couples where one partner has a smaller entitlement of their own. The Netherlands pays a dependant's supplement of 38 per cent of the principal earner's pension. The significance of these dependants' additions has declined due to married women's growing participation in the labour market. This means that most women already earn (or will soon earn) a pension entitlement of their own. The relation between the age pension for single people and couples in Australia is equivalent to a dependant's addition of 68 per cent.

Canada's system combines many different elements. The basic pension is an individual entitlement, and the claw-back of the basic pension from higher earners through the tax system is again based on individual income. The means-tested supplement, however, uses the couple as the unit of assessment. The benefit for a couple is 62 per cent higher than that for a single person, and the benefit is withdrawn against individual income rather than the income of the couple. The earnings-related pension is assessed individually with no extra payments for couples.

Other resource-tested schemes — such as Australia's age pension and the United Kingdom's minimum income guarantee — use the couple as the unit of assessment. Finland's basic pension and Sweden's guarantee pension, however, claw back the benefit on an individual basis not on the pension income of the couple.

5.2 *Gaps in contribution records*

There are again many different approaches to the protection of people with gaps in their working history, predominantly, of course, women who interrupt their careers to care for children or elderly relatives.

One source of protection is the provision for dependant's additions (in Australia, the Netherlands, the United Kingdom and the United States) outlined above. A couple would typically receive extra pension from this source when one partner never worked. However, increases in divorce rates and of never-married lone mothers in many countries weaken the degree of protection afforded by dependant's supplements. The growth in women's participation in the labour market mean that most of those who remain married now spend sufficient time in paid work to earn their own pension entitlement.

A second feature of pension systems that helps people with incomplete career histories are universal, basic pension schemes that are based solely (or mainly) on a residency test. Examples are Canada's old-age security and the basic scheme in the Netherlands. Similarly, resource-tested schemes, where they are assessed individually, ensure all pensioners receive a minimum income in their own right whatever their work record. Examples include the pension-income-tested schemes in Finland and Sweden.

In earnings-related schemes, there is a great tension in the goal of protecting people with contribution gaps and the insurance aspects of the scheme. This is particularly obvious in the 'notional accounts' systems in Italy and Sweden, whose main objective is to enhance the 'actuarial fairness' of the pension scheme. However, if benefits are related more closely to contributions then the scope for protecting people with low lifetime levels of contributions is curtailed.⁴⁵ Italy relies on its social assistance system to protect low-income workers, although periods of sickness, maternity, military service and unemployment are credited. Sweden allows for 'imaginary' contributions for periods spent out of the labour force for periods with caring responsibilities (and unemployment, sickness, education *etc.*).

The United Kingdom follows a similar approach in its public, earnings-related scheme (Serps). Under home-responsibilities protection, periods spent out of work caring for children under 16⁴⁶ or for elderly relatives are credited. So people can earn a full entitlement to both the basic pension and Serps with just 20 years of actual contributions. Although the United Kingdom's basic scheme is in theory contributory, the scale of the credits for periods not working makes it closer to the universal, residency-tested scheme of, for example, Canada.

Japan allows people to accrue the basic pension at one third of the normal rate during specifically exempt periods. Germany allows for so-called credited periods ('Anrechnungszeiten') to cover particular episodes of sickness, rehabilitation, unemployment, further education, *etc.* Since 1992, both parents have been able to claim credits for the first three years after the birth of a child should they so choose.

Some earnings-related schemes offer some protection to people with broken work histories with a progressive formula. This does not involve a credit for periods spent out of the labour force, rather by paying a proportionally higher pension to lower earners it

⁴⁵ See Disney (1999*a,b*) for an extensive discussion of the tension between redistribution and actuarial fairness.

⁴⁶ Or under 18 and still in full-time education.

protects, for example, women who work part time for a number of years. German workers earning under half the average can have their pensionable pay increased and the United States pays a much higher replacement rate on earnings up to 37 per cent of average. Canada and the United States exclude some of the lowest earning years from the lifetime average — 15 per cent of the total number of years and five years respectively — which has a similar effect. Canada also excludes periods of low earnings for people raising a child under seven from the calculation of average earnings.

The remaining earnings-related schemes, however, have no specific provisions for contribution gaps. These are Finland⁴⁷, Italy (mentioned above) and Japan, plus occupational schemes in the Netherlands and Sweden.

Quantitative modelling of the effect of these provisions on pension benefits is highly sensitive to the precise assumptions about earnings histories, career paths *etc.* In particular, the effect interacts strongly with the general pattern of pension provision with earnings. For example, the United Kingdom has probably the most comprehensive system of credits for periods out of the labour force of the 15 countries studied. Since its system provides relatively low levels of benefits overall, however, the actual benefit level may not be much higher than a country with narrower protection for contribution gaps.

5.3 *Self-employed*

The self-employed make up a significant and often growing minority of the workforce in many of the countries surveyed. Table 14 summarises the treatment of the self-employed in pension systems.

All the countries require the self-employed to participate in at least some mandatory pension programmes. However, in countries with a two-tier pension system, it is common for the self-employed to be covered by only the basic tier. Examples include Canada, Japan, the Netherlands and the United Kingdom. Finland, however, operates a separate mandatory occupational scheme for the self-employed that delivers the same benefits as the schemes for employees.

⁴⁷ Although an absence from work (*e.g.* for maternity leave) lasts less than one year than the worker will be covered.

Table 14. Pension systems and the self-employed

<i>Country</i>	<i>Coverage of self-employed</i>
Australia	Means-tested scheme only Incentives for voluntary private provision
Canada	Basic scheme only Not in earnings-related schemes (CPP/QPP)
Finland	Basic scheme Separate occupational plan (YEL/MYEL)
Germany	State scheme
Italy	State scheme
Japan	Basic scheme only
Netherlands	Basic scheme only
Sweden	Whole mandatory system
United Kingdom	Basic scheme only Not required to have second pensions (Serps, personal or occupational plans)
United States	State scheme

5.4 Post-retirement indexation of pension benefits

The results so far have presented pension values at retirement, but ignored the issue of the uprating of pension benefits after retirement. Indexation procedures, as this section shows, have an important effect on the lifetime value of pension benefits.

Table 15 summarises the post-retirement uprating procedures (based on the country chapters), ranked by the generosity from the least favourable at the top to the most favourable at the bottom. Private pensions in the United States are rarely changed once in payment. Automatic uprating is also rare in Canada, but the average of *ad-hoc* and automatic increases has, in the past, been roughly a rise of half of price inflation. Price uprating is common, particularly in public schemes, but the United Kingdom also requires its private pensions to index benefits (up to a ceiling). Sweden and Finland have complex formulae. Both grant real increases when real earnings are growing, in Sweden if pay growth exceeds a norm and in Finland simply if real wage growth is positive. Germany and the Netherlands index pensions in payment to net pay: the net minimum wage in the latter case and net earnings of pension contributors in the former. Finally, Italy increases pensions in line with a moving average of GDP growth.

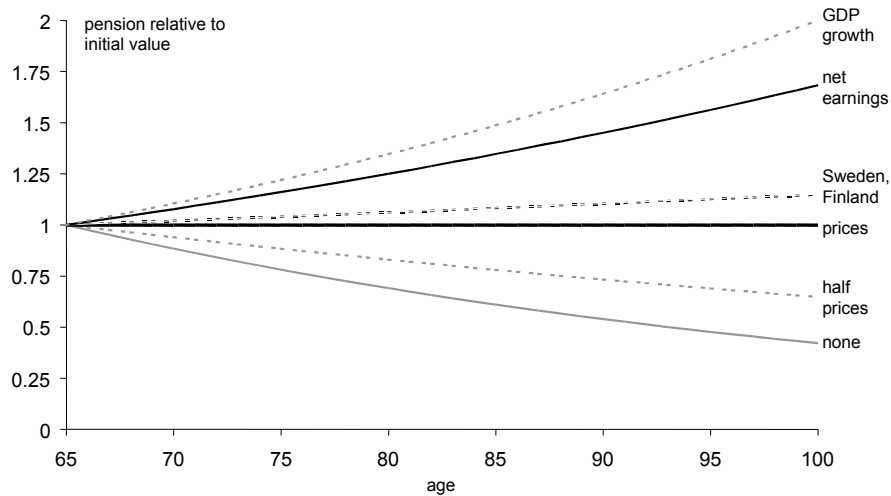
Table 15. Post-retirement indexation procedures in different pension systems

<i>Uprating procedure</i>	<i>Country and scheme</i>
No indexation	United States: occupational schemes
Half prices	Canada: occupational schemes
Prices	Canada: public schemes Finland: basic public pension Japan: public schemes Sweden: means-tested pension United Kingdom: public and occupational schemes United States: public scheme
Gross earnings less 1.6%	Sweden: earnings-related scheme
Gross earnings 20%, prices 80%	Finland: earnings-related scheme
Net minimum wage	Netherlands: basic public pension
Net earnings	Germany: public scheme
Gross earnings	Australia: public scheme
GDP growth	Italy: public scheme

The difference between these indexation procedures in a single year is small, but over time, the differences compound. Pensions can, of course, be paid for many years or even decades. Figure 10 shows the effect on the pension value over time of different indexation procedures from age 65. The Figure assumes that real earnings and real GDP grow by two per cent a year, and that price inflation is two per cent. The increase in contribution rates to finance the growing demographic burden on pension systems is assumed to reduce net wage growth below gross wages, to 1½ per cent a year. In Germany, for example, the contribution rate for pensions was projected to increase from 19.3 per cent in 1995, to nearly 30 per cent in 2030.⁴⁸ The Figure is normalised around price indexation, which keeps the real purchasing power of the pension constant.

⁴⁸ Börsch-Supan (1998). This is equivalent to a 0.3-0.4 per cent difference between net and gross earnings.

Figure 10. **Effect of different post-retirement indexation procedures on pension values in payment**



By age 80, the absence of indexation cuts the real pension value by more than 30 per cent, even at the relatively low level of 2½ per cent inflation. Semi-price indexation, the average in Canadian private pensions, would cut the pension value by 17 per cent over the 15 years from age 65 to 80. The formulae in Sweden and Finland give very similar results under these assumptions. At age 80, the pension is six per cent higher in real terms. Net earnings indexation would give a much larger rise — 25 per cent — while full indexation to earnings or GDP growth would increase pensions by 30 per cent over 15 years.

Using a mortality table, it is possible to calculate the effect on the lifetime present value of the stream of pension benefits uprated in different ways. The results of this exercise are shown in Table 16. With price indexation, the annuity factor at age 65 is 13.1. This means that a pension benefit of \$1,000 a year would have a present value of \$13,100. The absence of indexation cuts the real present value of a pension stream by 17.7 per cent. Indexation to GDP growth, giving a 2-per-cent-a-year increase, means the pension stream is worth an extra 19.2 per cent.

Table 16. Net present value of pension under different indexation procedures

<i>Uprating procedure</i>	<i>Annuity factor</i>	<i>Relative to price indexation</i>
No indexation	10.7	-17.7%
Half prices	11.8	-9.6%
Prices	13.1	0%
Gross earnings less 1.6%	13.5	3.4%
Net minimum wage	13.5	3.5%
Net earnings	14.9	13.9%
GDP growth	15.6	19.2%

6. Conclusion

This paper has calculated prospective pension entitlements for illustrative workers in 15 countries retirement-income systems. It has looked at both public and private schemes and at the effect of the direct tax system (personal income tax and social security contributions). The main focus has been on the treatment of workers at different income levels, but it has also looked briefly at different family types and workers with different career patterns. Ongoing work, involving the author and the OECD Secretariat, is extending the analysis to look at the position of people retiring at ages other than the standard pensionable age.

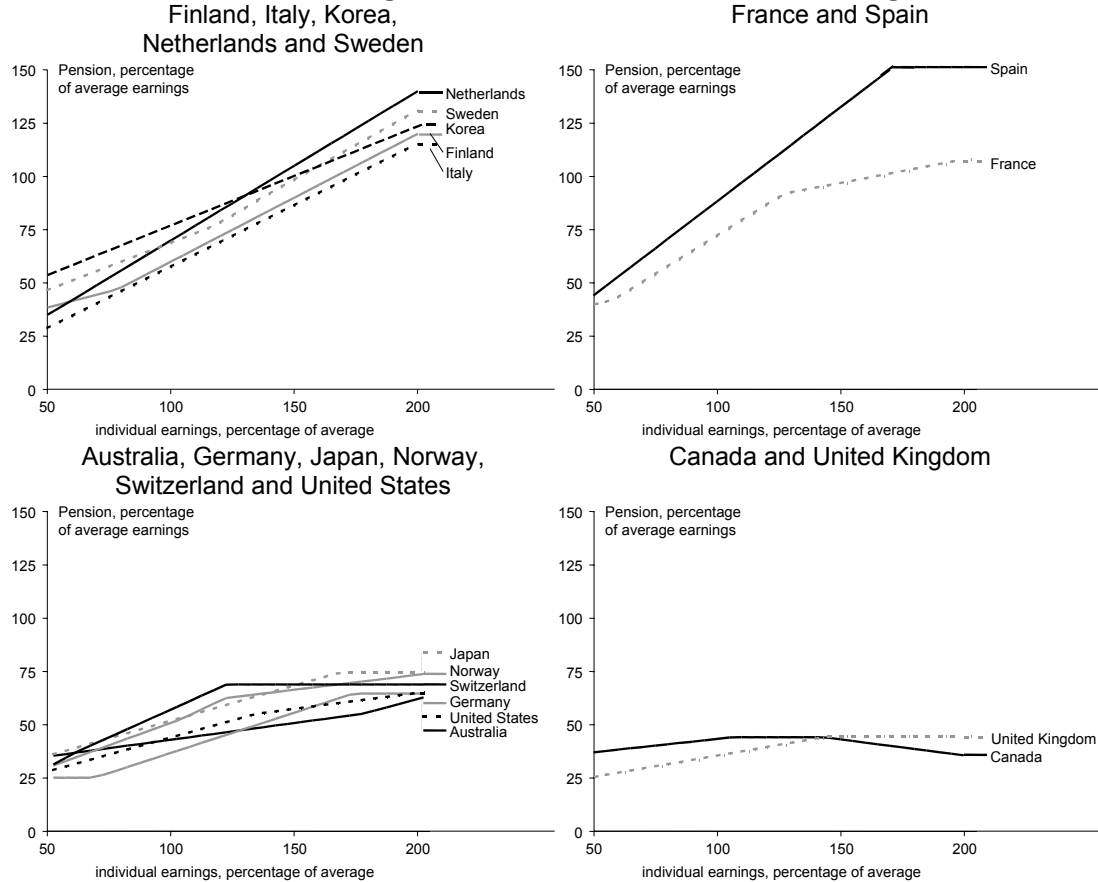
The most striking finding is the pattern of statutory pension values for people with different earnings levels. This result is summarised in Figure 11. The charts look at full-career workers earning various proportions of the economy-wide average: half, average, one-and-a-half times and twice mean pay. The vertical axis shows the corresponding individual pension value as a percentage of economy-wide average earnings. In Italy, the public pension scheme has a high ceiling. It is designed to achieve a great degree of earnings replacement, even for high-income workers. A similar effect is achieved by the statutory occupational pension system in Finland and the quasi-mandatory occupational schemes in the Netherlands and Sweden. The Dutch and Finnish systems have no ceiling to benefits; in Sweden, the ceiling is very high. Korea's severance pay scheme also has no ceiling. In these countries, there is some additional protection for low-income workers, but over much of the income range, projected pension values are linear.

At the other end of the spectrum, the philosophy of the Canadian and British systems is very different. These systems are more redistributive. They ensure that all pensioners achieve a basic standard of living rather than aiming to give everyone a certain

level of earnings replacement. This has led to development of extensive voluntary private coverage, particularly among higher-income workers. Both countries have mandatory earnings-related public schemes, but these have low ceilings and relatively low accrual rates.

France and Spain look similar to the first group of countries. Their pension systems are focused on an insurance objective, but ceilings are lower

Figure 11. Pension values as a proportion of economy-wide earnings for workers earning between one half and twice average



It is interesting to contrast these results with analyses of income-distribution data. OECD (2001) and Disney and Whitehouse (2001) find that the OECD countries achieve very similar outcomes in terms of the incomes of older people relative to people of working age. In countries that do not provide comprehensive earnings replacement for higher-income workers, such people make voluntary provision, either through occupational

or personal pensions or other forms of saving. This substitution of different forms of retirement-income provision is, of course, widely recognised in the pension literature.⁴⁹

The second key finding of this paper is the impact of the direct-tax system on the living standards of the elderly. This is both because of the general progressivity of the income tax and because pensioners often receive favourable treatment under the income tax and social security contribution regime. Net replacement rates — pensions after tax as a proportion of net earnings — are typically 10-15 percentage points higher than gross. The tax advantage makes up almost a third of the net replacement rate for someone earning the economy-wide average. It is therefore important that policy-makers do not consider the structure of pension benefits in isolation from the direct-tax position of older people.⁵⁰

It is difficult to compare countries' pension systems by looking at their parameters alone. This paper has shown that the pattern of statutory pension entitlements varies enormously between the 15 countries.

⁴⁹ See, for example, Börsch-Supan (1998) and Disney, Mira d'Ercole and Scherer (1998).

⁵⁰ See Keenay and Whitehouse (2001 and forthcoming) for a more detailed analysis of the tax position of older people.

7. Bibliography

- Agulnik, P. (1999), 'The proposed state second pension', *Fiscal Studies*, vol. 20, no. 4, pp. 409-421.
- Ahrend, P. (1996), 'Pension financial security in Germany', in Bodie, Z., Mitchell, O.S. and Turner, J.A. (eds), *Securing Employer-Based Pensions: An International Perspective*.
- Aldrich, J. (1982), 'The earnings replacement rate of old-age benefits in twelve countries: 1969-1980', *Social Security Bulletin*, vol. 45, no. 11, pp. 3-11.
- Antolin, P. and Suyker, W. (2001), 'How should Norway respond to ageing?' Working Paper no. 296, Economics Department, OECD, Paris.
- Atkinson, A.B., Rainwater, L. and Smeeding, T.M. (1995), *Income Distribution in OECD Countries*, Social Policy Studies no. 18, OECD, Paris.
- Bateman, H., Kingston, G. and Piggott, J. (2001), *Forced Saving*, Cambridge University Press.
- and Piggott, J. (1997), 'Private pensions in OECD countries: Australia', Labour Market and Social Policy Occasional Papers no. 23, OECD, Paris.
- and — (2001), 'Australia's mandatory retirement saving policy: a view from the new millennium', Pension Reform Primer series, Social Protection Discussion Paper no. 0108, World Bank, Washington, D.C.
- Blöndal, S. and Scarpetta, S. (1998), 'The retirement decision in OECD countries', Ageing Working Paper no. 1.4, OECD, Paris.
- Bone, M., Gregory, J., Gill, B. and Lader, D. (1992), *Retirement and Retirement Plans*, HMSO for the Office of Population Censuses and Surveys, London.
- Börsch-Supan, A. (1997), 'Retirement income: level, risk and substitution among income components', Ageing Working Paper no. 3.7, OECD, Paris.
- (1998), 'Germany: a social security system on the verge of collapse', in Siebert, H. (ed.), *Redesigning Social Security*, Kiel Institute of World Economics, Mohr Siebeck.
- , Reil-Held, A. and Schnabel, R. (1998), 'Pension provision in Germany', Discussion Paper no. 98-07, University of Mannheim.
- Bovenberg, A.L. (1993), 'The tax treatment of private pensions: the case of the Netherlands', V SB-CentER Progress Report no. 8, Tilburg University.
- Brugiavini, A. and Fornero, E. (2000), 'A pension system in transition: the case of Italy', Working Paper, Centre for Research on Pensions and Welfare Policy, University of Turin.
- Burniaux, J.-M., Dang, T.-T., Fore, D., Förster, M., Mira d'Ercole, M. and Oxley, H. (1998), 'Income distribution and poverty in selected countries', Working Paper no. 189, Economics Department, OECD, Paris.
- Clark, R.L. (1996), 'Japanese pension plans in transition', *Benefits Quarterly*, vol. 12, no. 1, pp. 59-74.
- Diamond, P.A. (1997), 'Insulation of pensions from political risk' in Valdés-Prieto, S. (ed.), *The Economics of Pensions: Principles, Policies and International Experience*, Cambridge University Press.
- Dilnot, A.W., Disney, R.F., Johnson, P.G. and Whitehouse, E.R. (1994), *Pensions Policy in the UK: An Economic Analysis*, Institute for Fiscal Studies, London.

- Disney, R.F. (1995), 'Occupational pension schemes: prospects and reform in the UK', *Fiscal Studies*, vol. 16, pp. 19-39.
- (1999a), 'OECD pension plans in crisis: what are the reform options?' Pension Reform Primer series, Social Protection Discussion Paper no. 9921, World Bank, Washington, D.C.
- (1999b), 'Notional accounts as a pension reform strategy: an evaluation', Pension Reform Primer series, Social Protection Discussion Paper no. 9928, World Bank, Washington, D.C.
- , Emmerson, C. and Tanner, S. (1999), *Partnership in Pensions: An Assessment*, Institute for Fiscal Studies, London.
- and Johnson, P.G. (eds) (2001), *Pension Systems and Retirement Incomes across OECD Countries*, Edward Elgar, Aldershot.
- , Meghir, C.H.D. and Whitehouse, E.R. (1994), 'Retirement behaviour in Britain', *Fiscal Studies*, vol. 15 no. 1, pp. 24-43.
- , Mira d'Ercole, M. and Scherer, P. (1998), 'Resources during retirement', Ageing Working Paper no. 4.3, OECD, Paris.
- and Whitehouse, E.R. (1991), 'Occupational and industrial earnings over time: the use of pooled cross-section data', Working Paper no. 91/7, Institute for Fiscal Studies, London.
- and — (1992a), 'Personal pensions and the review of the contracting out terms', *Fiscal Studies*, vol. 13, no. 1, pp. 38-53.
- and — (1992b), *The Personal Pensions Stampede*, Institute for Fiscal Studies, London.
- and — (1994), 'Choice of private pension and pension benefits in Britain', Institute for Fiscal Studies Working Paper no. 94/2.
- and — (1996), 'What are pension plan entitlements worth in Britain?' *Economica*, vol. 63, pp. 213-238.
- and — (1999), 'Pension plans and retirement incentives', Pension Reform Primer series, Social Protection Discussion Paper no. 9924, World Bank, Washington, D.C.
- and — (2001), *Cross-Country Comparisons of Pensioners' Incomes*, Research Report no. 142, Department of Social Security, London.
- European Commission, Directorate-General for Economic and Financial Affairs, (1998), 'Income benefits for early exit from the labour market in eight European countries: a comparative study', *European Economy*, Reports and Studies, no. 3.
- European Commission, Directorate-General for Employment, Industrial Relations and Social Affairs (1999), *MISSOC: Mutual Information System on Social Protection in the Member States of the European Union*, Brussels.
- Eurostat (1993), *Old Age Replacement Ratios, vol. 1, Relation between Pensions and Income from Employment at the Moment of Retirement*, Statistical Office of the European Communities, Luxembourg.
- Förster, M.F. and Pellizzari, M. (2000), 'Trends and driving factors in income distribution and poverty in the OECD area', Labour Market and Social Policy Occasional Paper no. 42, OECD, Paris.

- Gosling, A., Machin, S. and Meghir, C.H.D. (1998), 'The changing distribution of male wages in the UK', Working Paper no. 98/9, Institute for Fiscal Studies, London.
- Hamann, A. Javier (1997), 'The reform of the pension system in Italy', Working Paper no. 97-18, International Monetary Fund, Washington, D.C.
- Hauser, R. (1997), 'Adequacy and poverty among the retired', Ageing Working Paper no. 3.2, OECD, Paris.
- International Bureau of Fiscal Documentation (1999), *European Tax Handbook*, Amsterdam.
- Johnson, P.G. (1998), *Older Getting Wiser*, Institute of Chartered Accountants in Australia, Sydney.
- , Disney, R.F. and Stears, G. (1996), *Pensions 2000 and Beyond*, vol. 2, 'Analysis of Trends and Options', Retirement Income Inquiry, London.
- Kalisch, D.W. and Aman, T. (1998), 'Retirement income systems: the reform process across OECD countries', Ageing Working Paper no. 3.4, OECD, Paris.
- Keenay, G. and Whitehouse, E.R. (2002*a*), 'The role of the personal tax system in old-age support: a survey of 15 countries', Working Paper no. 02/07, Centre for Pensions and Superannuation, University of New South Wales.
- and — (2002*b*), 'Financial resources and retirement in nine OECD countries: the role of the tax system', Labour Market and Social Policy Occasional Paper, OECD, Paris, forthcoming.
- and — (2002*c*), 'Taxing older people', in OECD, *Taxing Wages*, Paris.
- Kunio, I. (1993), 'The future of Japanese pension funds: the challenges of managing money after the bubble', Occasional Paper no. 93-04, US-Japan Relations Program, Harvard University.
- McHale, J. (1999), 'The risk of social security benefit rule changes: some international evidence', Working paper no. 7031, National Bureau of Economic Research, Cambridge, Mass.
- Meadows, P. (1999), 'The flexible labour market: implications for pensions provision', National Association of Pension Funds, London.
- Meghir, C.H.D. and Whitehouse, E.R. (1996), 'The evolution of wages in the UK: evidence from micro data', *Journal of Labor Economics*.
- Mitchell, O.S. and Dykes, E.L. (2000), 'New trends in pension benefit and retirement provisions', Working Paper no. 2000-1, Pension Research Council, Wharton School, University of Pennsylvania, Philadelphia.
- National Association of Pension Funds (1996), *Annual Survey*, London.
- (1999), 'Pension reform based on flawed labour market assumptions', Press Release, 10 August.
- Norway, Ministry of Health and Social Affairs (2000), 'The Norwegian social insurance scheme', Oslo.
- OECD (1995), *Private Pensions in OECD Countries: Canada*, Social Policy Studies no. 15, Paris.
- (1999), *Benefits and Work Incentives*, Paris.
- (2000*a*), *Taxing Wages 1998-99*, Paris.

- (2000*b*), *Reforms for an Ageing Society*, Paris.
- (2001), *Ageing and Income: Financial Resources and Retirement in Nine OECD Countries*, Paris.
- Queisser, M. (1996), ‘Pensions in Germany’, Policy Research Working Paper no. 1664, World Bank, Washington, D.C.
- Scherman, K.G. (1999), ‘The Swedish pension reform’, Issues in Social Protection Discussion Paper no. 7, International Labour Office, Geneva.
- Schmähl, W. and Böhm, S. (1994), ‘Occupational pension schemes in the private and public sector in the Federal Republic of Germany — an overview’, Working Paper no. 94/5, Zentrum für Sozialpolitik, University of Bremen.
- Sundén, A. (1998), ‘The Swedish pension reform’, *mimeo.*, Federal Reserve Board, April.
- (2000), ‘How will Sweden’s new pension system work?’ Issue in Brief no. 3, Center for Retirement Research, Boston College, Boston, Mass.
- Takahashi, H. (1999), ‘Trends in Japan’s corporate pension system’, Report no 11A, Japan Economic Institute, Washington, D.C.
- Takayama, N. (2000*a*), ‘An outline of the defined contribution pension plan — Japan’s version of the 401(k) plan’, *JETRO Investment News*, no. 21.
- (2000*b*), ‘How about the future picture of pension programs in Japan?’ *mimeo.*, Hitotsubashi University, Tokyo.
- Timmins, N. (1999*b*), ‘Pensions policy is based on “false analysis”: government’s stakeholder plans criticised for assumptions about employment patterns’, *Financial Times*, 9 August.
- Turner, J.A. and Watanabe, N. (1995), ‘Private pension policies in industrialized countries: a comparative analysis’, W.E. Upjohn Institute for Employment Research, Kalamazoo, Mich.
- United Kingdom, Department of Social Security (1994), *Survey of Employers’ Pension Provision*, HMSO, London.
- (1998*a*), *A New Contract for Welfare: Partnership in Pensions*, London.
- (1998*b*), *Second Tier Pension Provision 1995-96*, London.
- (2000), *The Pensioners’ Income Series 1997-98*, London.
- United Kingdom, Government Actuary (1995), *National Insurance Fund Long-Term Financial Estimates*, HMSO, London.
- (1996), *Occupational Pension Schemes in 1991: Ninth Survey*, HMSO, London.
- United Kingdom, Inland Revenue (1999), *Inland Revenue Statistics*, London.
- United Kingdom, Pension Provision Group (1998), *We All Need Pensions: The Prospects for Pension Provision*, The Stationery Office, London.
- (1999), *Response to the Pensions Green Paper*, Department of Social Security, London.
- United States, Department of Labor (1999), *Private Pension Plan Bulletin: Abstract of 1996 Form 5500 Annual Reports*, Pension and Welfare Benefits Administration, Washington, D.C.
- United States, Social Security Administration (1999), *Social Security Programs throughout the World*, Department of Health and Human Services, Washington, D.C.

- (2000*a*), ‘How your retirement benefit is figured’, Washington, D.C.
 - (2000*b*), ‘A desktop guide to SSI eligibility requirements’, Washington, D.C.
 - (2000*c*), ‘You may be able to get SSI’, Washington, D.C.
- Watanabe , N. (1996), ‘Private pension plans in Japan’, in Bodie, Z., Mitchell, O.S. and Turner, J.A. (eds), *Securing Employer-Based Pensions: An International Perspective*.
- (1998), ‘Occupational pension systems in Japan’, *Japan Institute of Labour Bulletin*, vol. 37, no. 8.
- Whiteford, P. (1995), ‘The use of replacement rates in international comparisons of benefit systems’, *International Social Security Review*, vol. 48, no. 2.
- Whitehouse, E.R. (1998), ‘Pension reform in Britain’, Pension Reform Primer series, Social Protection Discussion Paper no. 9810, World Bank, Washington, D.C.
- (1999), ‘Tax treatment of funded pensions’, Social Protection Discussion Paper no. 9910, World Bank, Washington, D.C.
 - (2000*a*), ‘Paying for pensions: international evidence on the structure and level of administrative charges for mandatory funded pensions’, Occasional Paper series, Financial Services Authority, forthcoming.
 - (2000*b*), ‘Administrative charges for funded pensions: an international comparison and assessment’, Social Protection Discussion Paper no. 0016, World Bank, Washington, D.C.
 - (2000*c*), ‘How poor are the old? A survey of evidence from 44 countries’, Pension Reform Primer series, Social Protection Discussion Paper no. 0017, World Bank, Washington, D.C.
 - (2002), ‘The value of pension entitlements: a model of nine OECD countries’, Labour Market and Social Policy Occasional Papers, OECD, Paris, forthcoming.
- Yamada, A. (2001), ‘The evolving retirement-income package: trends in adequacy and equality in nine OECD countries’, OECD, Paris.
- and Casey, B.H. (2001), ‘Getting older, getting poorer? A study of the earnings, pensions, assets and living arrangements of older people in nine countries’, OECD, Paris.